POPULAR SCIENCE

NOVEMBER · 35c *Monthly*

Hottest New Compact Car

Chrysler's Valiant on Test Track PAGE 99

Plus News and Pictures of 9 Other 1960 Cars

CHEVROLET · FORD · PLYMOUTH
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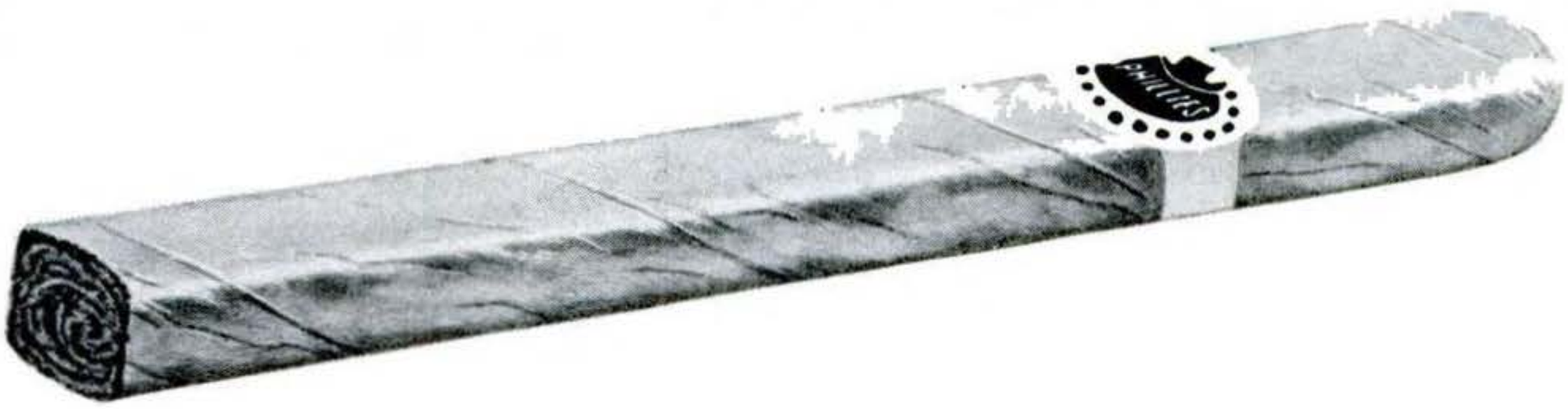

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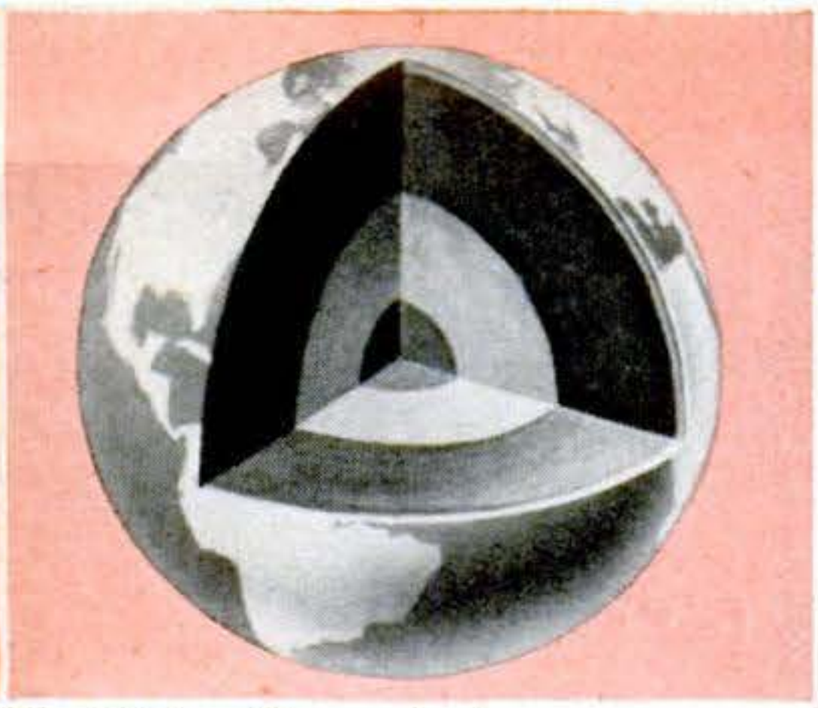

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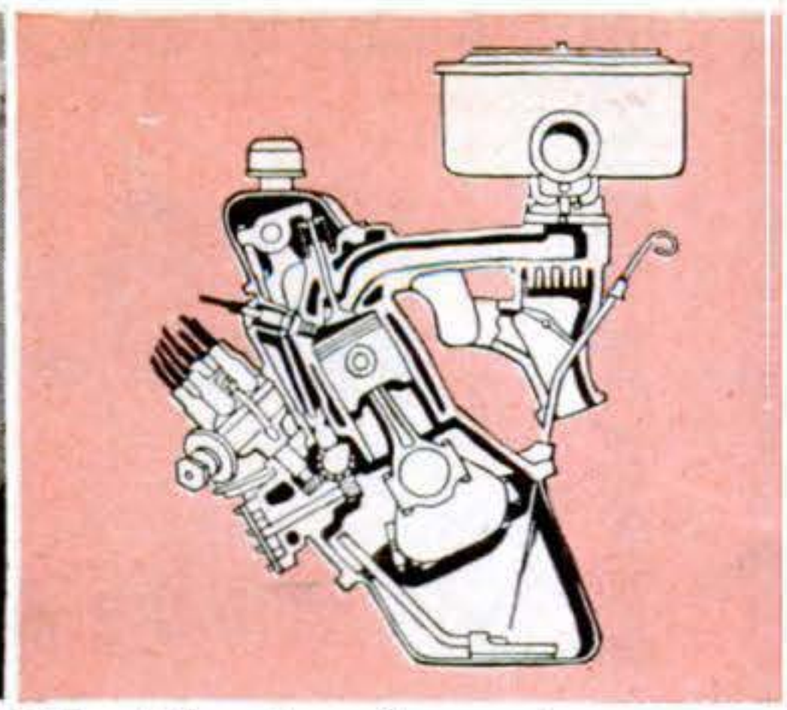

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Founded in 1872 Vol. 175 No. 5 *Mechanics and Handicraft* REG. U. S. PAT. OFF.

Popular Science

November, 1959

Cover photo by W. W. Morris

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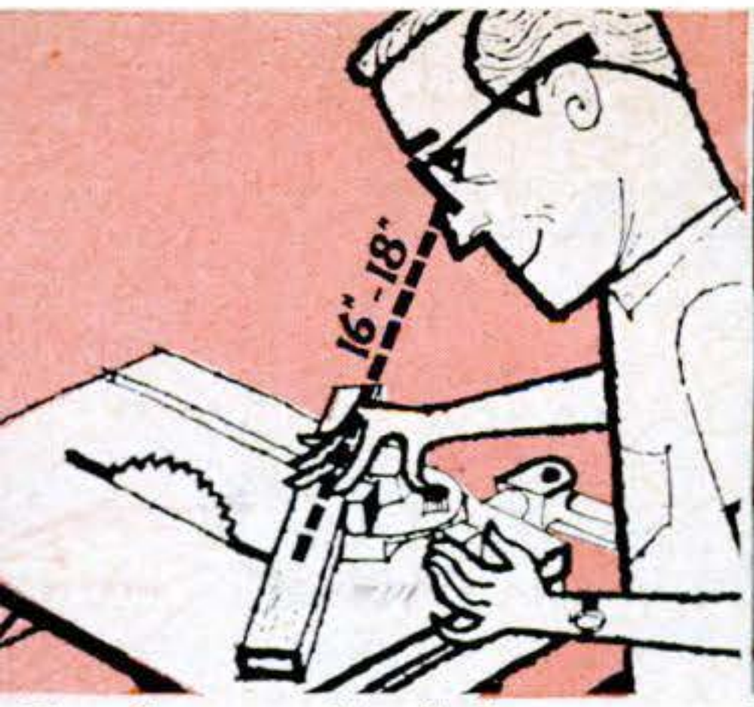

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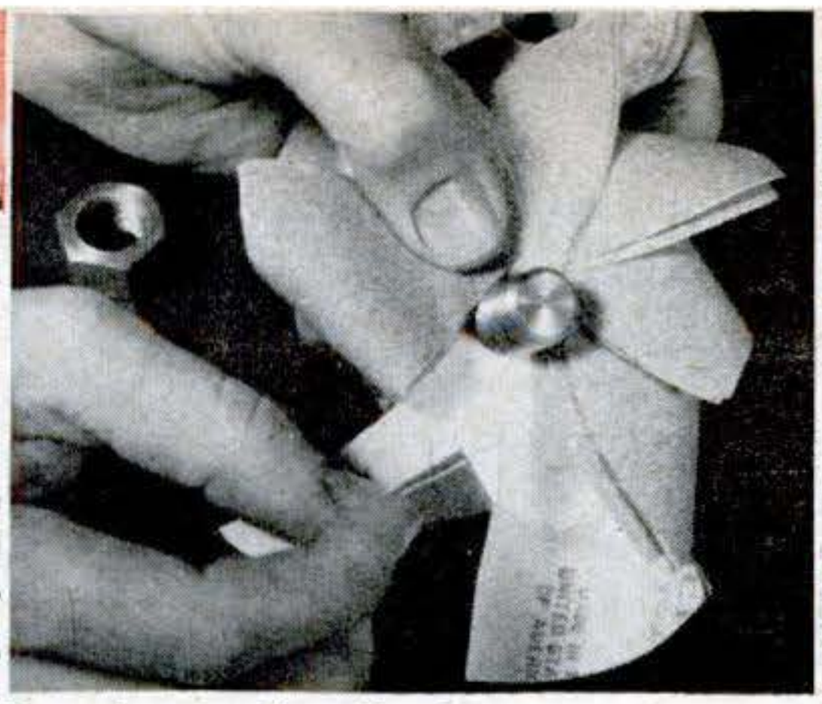

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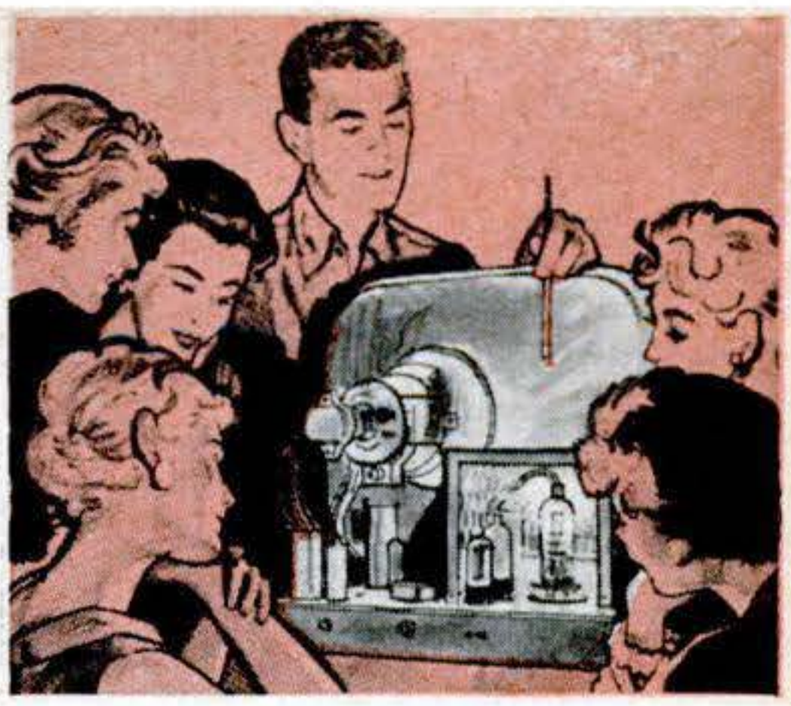

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America's Leading New-Idea Magazine for 87 Years

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PS Readers TALK BACK

Safe-Driving Tips Appreciated

I ENJOYED particularly "How to Drive and Stay Alive" [Aug.]. I'd like to suggest equipping cars with a small bazooka firing rearward to dispose of the motorist (or tractor-trailer driver) who stays 25 feet behind when you're on a turnpike doing the legal limit.

GEORGE STRASSER, Brooklyn.

. . . I'VE driven for quite a few years, yet I learned a lot from your safe-driving tips.

In fact, those 14 commandments for survival would save so many lives they should be published as a text for high-school drivers' courses. The students certainly would be impressed by a race driver who would drive 45 m.p.h. in a 50-m.p.h. zone because his cone of safety had been narrowed.

Thank you again for giving my family and myself some added safety and, quite possibly, added years of life.

L. C. VERSTYNEN SR., Rockford, Ill.

Love That Workbench Blueprint

WE take off our hats to your new idea of the free blueprint ["Exciting New Split-Level Workbench," Sept.]. It is great! We hope to see more of them.

THE KONIOR FAMILY, Hartford.

Not All Sea Salts Are Salt

THE bit on desalting water in "The Month in Science," [Aug.] was very interesting to me since, as patent attorney, I prepared the patent application on the process for the Department of the Interior. The inventor was the late, world-renowned chemical engineer, Dr. W. L. Badger.

You say that *salt* is added as a sludge to the evaporators and that the sea salt crystallizes around this added-salt nucleus. What is added is not *salt* (NaCl), but the sludge that forms on evaporation surfaces before the more soluble sea salts are deposited. This sludge is a mixture mainly of calcium carbonate, magnesium hydroxide and calcium sulfate. The hard, rock-like deposit formed on the evaporator surfaces by these compounds cuts down heat transfer. This was the stumbling block in previous sea-water evaporation systems.

The sea salts precipitate harmlessly on the sludge nucleus, instead of on the evaporator surfaces.

ERNEST S. COHEN, Silver Spring, Md.

Mushrooms Mushroom All Over

THERE'S something new around here. This summer's heat and humidity have caused a lot of mushrooms to sprout out of some of my neighbors' wall-to-wall carpeting.

I took this picture of a mushroom growing out of my bathroom floor where the inlaid linoleum meets the wall.

What can we do about it?

STEWART ROUSE, Lewisville, Ind.

Try a dehumidifier. Or go into the mushroom business.

A Blast at the Tucker

FRED FETNER ["PS Readers Talk Back," Aug.] must have been reading old Tucker ads. In no other way could he soak up such a mass of misinformation!

Of the 49 Tuckers—hand-built at enormous cost—none had fuel injection, electronic ignition, four-wheel hydraulic drive, automatic transmission, or airplane brakes, although these had been promised by the visionary Tucker advertising.

The four-speed transmissions were reworked Cords with electric gearshift. The

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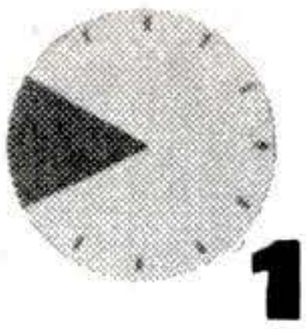

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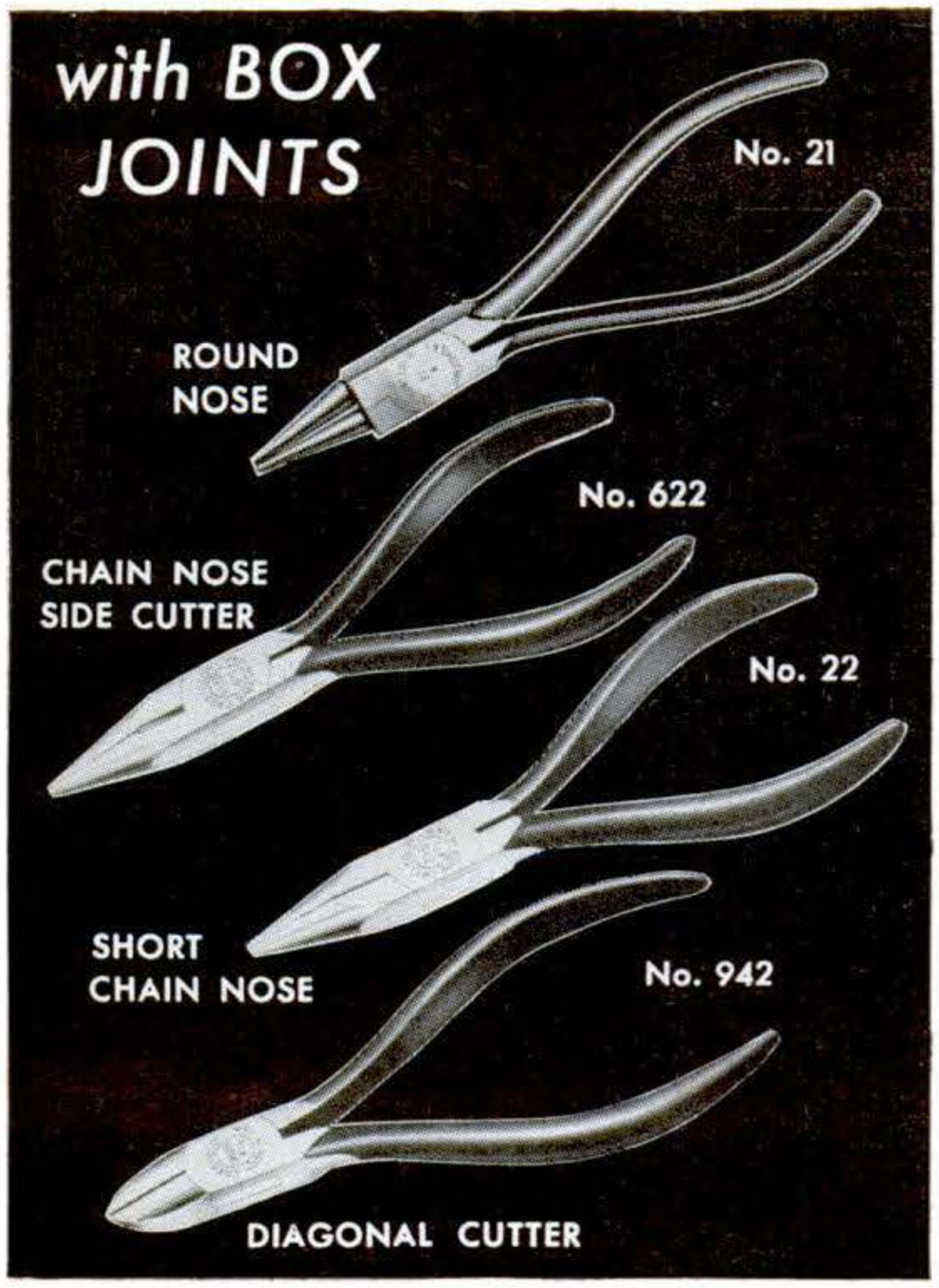

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HAROLD E. GLOVER, Minneapolis.

More Light on Lightning

I FOUND "The Awesome Miracle of Lightning" [Aug.] helpful. It points out the usefulness of the phenomenon and explains how it occurs. But I was left with a troublesome question.

The author asserts, as others do, that lightning actually goes *up*. This I can understand, or could, until he later says that the lightning bolt travels from out-

side a building into it; travels along the ground, ripping a trench, knocking a hole in the basement wall and doing other such destructive damage. This seems to contradict the statement that it travels upward.

OTIS G. CARNES, Fayette, Mo.

Lightning is a complicated phenomenon. It might be more accurate to say that intense electrical fields are set up. Where these fields overcome natural resistance to the passage of electricity, current flows. The currents could go out of a house as well as into it, along the ground or a fence, or anywhere else, depending on the nature of the field and the material.

The main current of lightning, however, follows an upward direction in general, as our article stated.

. . . COULD you settle an argument in our family? About a month ago lightning struck our house (one of the tallest in the vicinity) and knocked the chimney off. At the same time, the TV set stopped and required repairing. Ever since, we have shut off the TV when there is a lightning storm. Was the lightning attracted to our house because the TV was turned on?

GERRY KALYNIUK, Winnipeg, Can.

Having your TV turned on would make no difference. The antenna mast should be grounded, however, and a lightning

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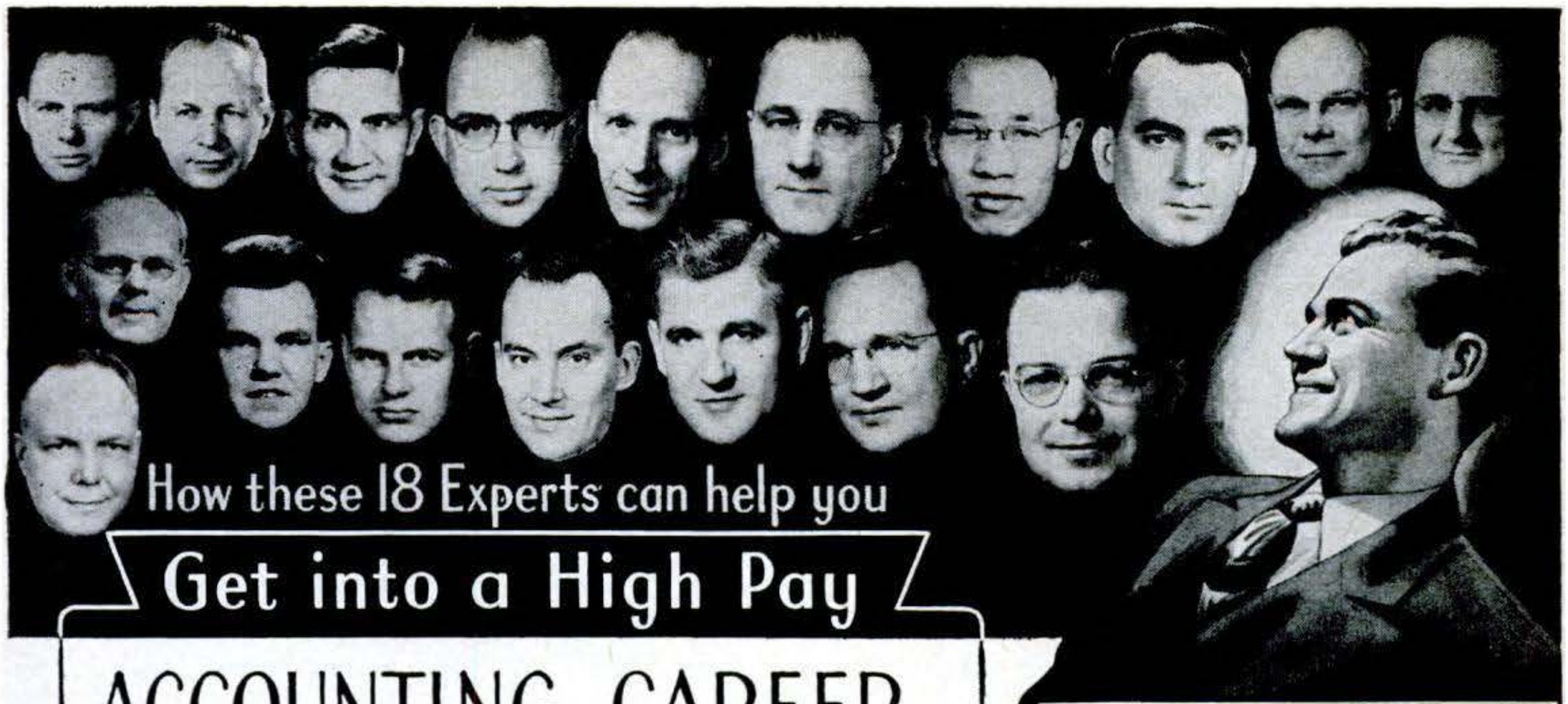

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SAVE ON AMMUNITION
No. 177 1,000 Pellets $3.49
No. C-13 72 MULTICOLOR DARTS.....$2.69

A masterpiece! You get 1. Contoured stock of hand rubbed caucasian wood. 2. Barrel is of heavy duty high carbon steel, with interior swirl rifling. Handsomely blued. 3. Sights are precision made and mounted and adjustable for elevation. 4. High capacity air compression chamber. 5. Positive action easy flow trigger—don't "pull" the trigger, merely glide it back easily, smoothly to fire. 6. Balanced weight distribution, and many other sterling features. Not shipped to N.Y. C. residents. Add $1 for shipping cost for this heavy shipment (Approx. 7 lbs.) Remit only 8.88 plus $1 postage, total: $9.88. No. 940.

.22 CAL. GERMAN AUTOMATIC!

NOT $9.95
NOT $7.95

4.99

NOT SOLD TO MINORS

Genuine .22 Cal. German AUTOMATIC. Exact dimension, finish and design of the death-dealing automatic. Not lethal—but NOT SOLD TO MINORS! Solid blue carbon steel. Ideal for track and swim meets, football games, training canines, for theatre and stage work. 6-shot FULLY AUTOMATIC! Self-ejecting clip. Safety Catch. DeLuxe cordovan handle. Comes with cleaning brush. No permit needed but not shipped to NYC residents. Sells elsewhere for $6.95 and $7.95—Thoresen's imports direct from West Germany and you SAVE MONEY! Our cut price only $4.99 while supply lasts. Sorry, no COD's on this item. No. 111 $4.99

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585 Water St., N.Y. 2, N.Y.

POCKET WATCH

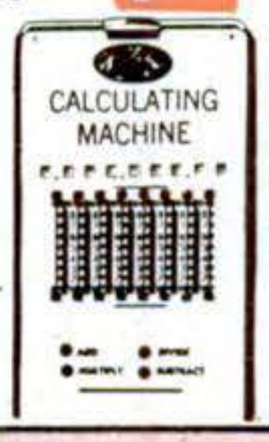
$4.98 VALUE **1.77**

No fancy diamond dial or wafer thin case. No alligator or golden band. No plush velvet gift box — and NO FANCY PRICE TAG EITHER! In fact, only $1.77—YES, ONLY $1.77—buys this rugged, old-fashioned railroad-type watch. Never before has this watch sold for so low a price. And it's guaranteed for 3 years too! If you want an old-timer that evokes interest—and keeps darn good time—buy this old "choo choo" watch. (Limit: one to a customer.) Pocket Watch—now reduced to $1.77 plus 18c Federal Tax. TOTAL: $1.95 No. 251

FAMOUS GERMAN POCKET ADDING MACHINE

1.00

NOT 3.98 NOT 2.98



Others pay $3.98 for machines that calculate to 999,999. Wizard Calculator goes to ONE BILLION—yet costs only $1 plus 25c postage. Korium steel mechanism. Sleek, slim. Fits pocket. Unbreakable in normal use. Never makes a mistake. Press numbers: see answers pop into view like cash register. Tally scores, statements—use at market to add up purchases as you take them off shelves. Know your bill before you reach tally-out counter. West German import. Free stylus given. No. 118. $1 plus 25c postage. $1.25 total.

HEAVY-DUTY SLINGSHOT *with Built-in RANGE FINDER*

NOT 1.98 **1.00**

Extra powerful slingshot gives longer range, greater accuracy! Extra thick Quadrangular slings with amazing pull! Kills small game, routs pests. Ideal for target practice. Cross-bar range finder assures greater accuracy. Thick leather pouch. Brass-riveted slings. Ebony finish wood. Super silent—hits like rifle!
FREE: 100 Killer Steel Pellets. Extra pellets only 75c for 400. Send only $1 plus 25c mailing costs. No. 928

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5,000,000 CHRISTMAS SALE!

once again is Thoresen's big annual Christmas sale—ng you top quality merchandise at bargain prices so ou can't match them anywhere! Millions of satisfied ners already know the reason Thoresen's is able to sell its competitors: we buy by the carload and boat-we get lower prices as a result—and WE PASS SAVINGS ON TO YOU! Many of the items shown ese two pages are exclusive with us and many are ted from all over the world . . . but all are offered at bottom prices! And this year we are going even further in offering our customers the utmost in value: ON ALL PREPAID ORDERS THAT TOTAL $9.99 AND UP WE ARE SENDING A SURPRISE CHRISTMAS GIFT ALONG WITH THE ORDER! This absolutely free bonus includes some items that retail for as much as $10.00! So don't delay! Use the coupon below and mail it today! All merchandise is offered on a 10-day money back guarantee. You don't risk a penny! Be sure and mail the coupon to:

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"light-as-a-feather" Insulated Vest feels ner than five—yes FIVE—bulky, woolen ters. That's the claim we make. Best of all, can move freely. Your body doesn't feel con-ed by cumbersome, tight-fitting sweaters. s why this Dacron Insulated Vest is such a rite among hunters, rugged sportsmen, ice rmen. That's why it's worn by Salesmen, Bus rs, Construction Engineers, Milkmen, Letter ers, Telephone Linemen, State Troopers, etc., Men who work outdoors appreciate the com-and the warmth of this amazing insulated vest. an extra-large zipper that can't freeze. Two roomy pockets with inside elastic shell loops. washable. Dries fast. SHRINKPROOF! Keeps e. Dustproof. Mothproof. This same Insulated sold for $9.95—now only $4.98 to our mers. **No. 53 Insulated Vest $4.98**

ORIG. SOLD FOR $9.95

4.98

CUT PRICE

SIZES:
SMALL (36-38)
MEDIUM (40-42)
LARGE (44-46)
EX. LG. (48-50)

TRIPLE GARD DELUXE MODEL—ONLY 98c MORE

the man who prefers the BEST we mmend our Deluxe TRIPLE GARD model. yours for only 98c more. Only a gar-t of the finest workmanship can bear famous TRIPLE GARD label. Yet you only $5.96. Brown or neutral gray. 53-D.

INSULATED BOOTIES

Fabulous foot warmers for all outdoor action. Durene knit trim tops, quilted insulated boot. Keeps feet nice and warm even in BELOW ZERO weather. Wear 'em with your insulated undersuit. Order several pair at our special Thoresen-to-you price of $1.94 per pair. Neutral color. State your shoe size. No. 546

REG. 2.98

1.94

Almost Half a YARD Long

GIANT 5-CELL FLASHLIGHT

complete new Powerhouse shlight contains engineering fea-es never before produced! Tre-ndously powerfull 5 cells—with this big power concentrated a spot beam that shatters ance, provides wondrous luminosity! Special new Opti-View reflector and gleaming metallic case that's over 15 inches long! It will illuminate targets heretofore only reached by giant searchlights! An ideal flashlight No. 706—

COMP. VALUE 4.98

$1.00 PLUS 25c POST.

9 x 12 FOOT PLASTIC TARPAULIN

ORIG. 1.25 PLUS POST.

47¢

9 x 12 ft. Protects carpets, floors, upholstery—yet you still see beauty of fabrics! Protects outdoor furniture, garden tools, bikes, cars, boats, air conditioners. WATERPROOF, dust-proof, tear-resistant. Use as drop cloth when painting, to make TRANSPARENT auto seat covers, furniture, slip covers, etc. This is original Trans-Kleer brand—the best! Order by No. 4. 47c per giant cloth.

Insulate Your Home with Plastic STORM WINDOWS

ORIG. 49c EA. **19½¢**

Transparent like glass yet Trans-Kleer won't shatter, rattle, break or peel. Install in minutes. No nails. Just cut and fit window, press on Adheso border tape—that's all! Shipped in rolls measuring 35" by 32"—enough for 10 windows. Reduced from $4.95 to only $1.98. 2 kits $3.93. No. 74.

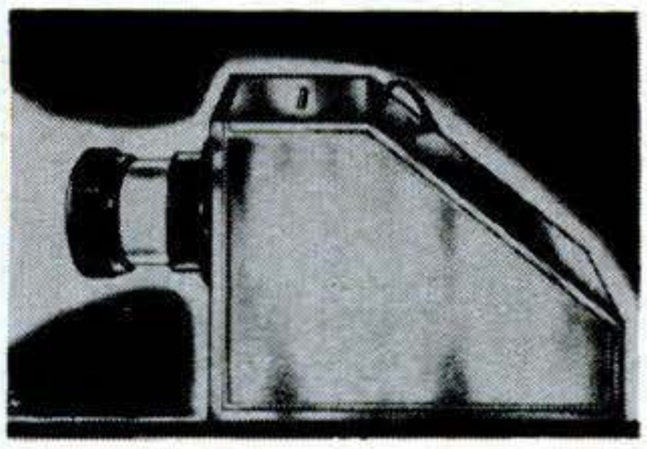
00 Power Projector Flashes Comics, Photos, en Live Insects on Wall to Giant Size . . . in Colors!

E REDUCED on the amazing X-500 er Vision Electric Projector—needs films, no negatives, no strips, no s. Picks up the image DIRECT from object, snapshot, book, sketch, etc. it shoots it out thru a powerful ex lens, flashes it onto your wall iant size—and in full colors! It transmits LIVE MOTION—showing inery, animals, insects IN ACTION. Thousands of ctors originally sold at prices of $7.00 to $14.95. SELLING OUT entire stock at the rock-bottom of only $4.98 complete.

your Power Vision Projector now at the "giveaway" of only $4.98 plus 27c to defray heavy postage. AL: $5.25. Order by No. 370

ORIG. 14.95

4.98



$1 ANY ITEM HERE VALUES TO 2.99 $1

20 MAGNETS

These permanently magnetized Magnets lift 80 times their own weight! And you get not 5 or 10 but 20 Powerful Magnets for only $1! Use 'em 101 different ways—sew into pot holders—magnet holds them to stove, sink, refrigerator! No. 426

Collar Stays—$1 36 Stainless Steel

STAINLESS STEEL beauties that can't RUST, BREAK, or BEND! They won't fuse to collar when ironed or twist in shirt if washed—in case you forget to remove them. Look! You get 36 for $1—assorted sizes. Order by No. 732

Holds 30 Belts

Belts Click On . . . Click Off!

Rotating action allows you to remove belt you select without having to remove any others. Hangs on closet rod or hook. Belts click on . . . click off. Holds up to 25 belts easily. Steel construction. No groping for the "right" belt. No more removing 3 or 4 belts to get the one you want. Now you get the belt you want in 2 seconds— No. 944

Seals Cards & Papers in Clear Plastic in 1 Minute

With this do-it-yourself "Seal-in-Plastic" Kit you can seal wallet-size cards or photos—even birth certificates, discharge papers, clippings, announcements, blueprints, mementos, etc., fast and easy. Simple finger-tip pressure seals in plastic in a jiffy! Each GIANT kit includes 12 4"x4" plastic sheets PLUS a bonus of 6 additional 5"x7" sheets. No. 248

Thoresen Hole Saw

Saws Any Shaped Hole for ¼" Drills!

Insert this hole saw into chuck of your ¼" electric drill. Bore thru material as usual with steady, easy pressure. Enlarge hole by moving "Hole Saw" in widening circles. You saw ANY shaped hole with full saw stroke and light pressure. Easily bores thru wood, plastic, plaster, plyboard, etc. No. 42

4 BRISTLE BRUSHES

One each: ½", 1", 1½", 2". All pure 100% bristle Vulcanized in rubber. Ideal for touch-up trim, sash, moulding, for furniture refinishing, etc. Comparative Value $2.98. No. 570. 4 Paint Brushes.

8-Pc. WRENCH SET

8 piece set in handy plastic kit, contains 8 drop-forged chrome-plated wrenches. One side box-end, sizes 7/32"-7/16"; other side open end, sizes 1 3/64" to 3/8". Ideal for repairs around the house or for car repairs. Order by No. 701. 8-pc. Wrench Set, $1.

Korium 9-in-1 Knife

Can Opener, Small Knife, Screwdriver, File, Bottle Opener, Corkscrew, Scissors, Awl, Jackknife—3 inches long. Genuine Korium steel. Bone handle. Fits pocket. Thousands sold at $1.98 now yours for $1. No. 114

Electric Magnifier

Lights Up as It Magnifies

Magnifies five times larger. Brilliant light illuminates object viewed. Makes smallest speck stand out. Examine stamps, coins, currency, signatures, fingerprints, photos, machine parts, jewelry, etc. Ideal for reading "fine print" in contracts, leases, policies, etc. Uses standard flashlight battery (not incl.) NOT $1.25 No. 610.

BLACK FOREST Hunting Knife

World's most fabulous hunting knife! Over 100,000 sold for $3.95. Now this genuine Black Forest Knife yours for only $1. Extra thick, high carbon tempered Korium Steel—can cut thru metals! Sharp enough to shave with. No. 76

COMBI-MATIC

SAVE $2.00! 8 instruments in one. Pocket binoculars, magnetic compass, magnifying glass, reading glass, telescope, laryngoscope, stereoscope and even a sun dial watch. No. 93

8 Instruments in 1

50x Pocket Microscope from Germany

Metal design, optically ground lenses. Easy eyepiece focusing. Made by famous West German optical plant. See nature's wonders. Examine jewelry, watches, smears, textiles, tissue, etc. We've sold thousands originally for $1.98. No. 12

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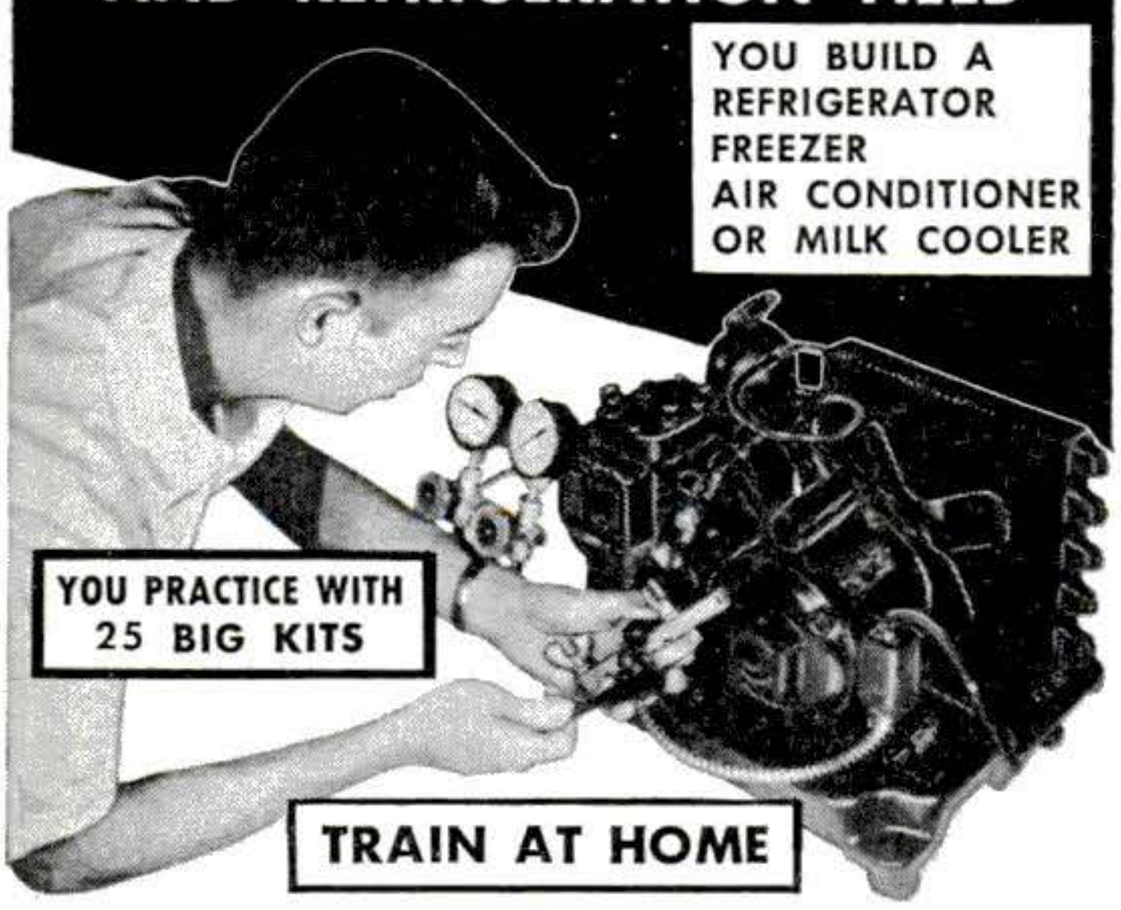
Be a Top-Pay-Man in the Fast-Growing

AIR CONDITIONING

AND REFRIGERATION FIELD



THAT BETTER JOB or A BUSINESS OF YOUR OWN is within your reach. Opportunities are *plentiful* in the air conditioning and refrigeration field. Although old and established, this industry is booming. Today, over 150 million units are in use. Last year, 3 million refrigerators, 1 million freezers and two million air conditioners were sold.

THOUSANDS OF MECHANICS ARE NEEDED to keep these units in working order. Trained men earn up to $150 a week and more . . . and work steady. So, why saddle yourself with low income when you can enjoy a better job, better pay, better living? *To find out how, just fill out and mail coupon.* Do it now.

CTI TRAINS YOU AT HOME IN A FEW MONTHS

You get practical training along with real experience because CTI sends you 25 big kits. You assemble a heavy-duty, commercial-type, ¼ h.p. high-side (illustrated above). You run many tests, do 10 complete trouble-shooting and repair jobs. You build and keep an air conditioner, freezer, refrigerator or milk cooler. Only CTI sends you this equipment—at no extra cost. Easy picture lessons make training easy.

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Soon after you enroll, use your newly-acquired skill to do repair jobs in your community. Earn extra cash. Some students make up to $15 a week and more—others open a shop. Mail coupon now!—Commercial Trades Institute, 1400 Greenleaf Ave., Chicago 26.

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arrester installed in the antenna lead-in wire.

A Vote Against Lube-Free Cars

DESIGNING "Cars That Never Need a Grease Job" [Sept.] seems like a good idea at first thought. My experience in the garage business, however, is that some moves in this direction have turned out badly for car owners.

Take the sealed ball bearings now widely used for rear wheels. One friend had the rear quarter of his car catch fire

due to sealed-bearing failure. Another, learning of this, installed new rear-wheel bearings as preventive maintenance—and none too soon at 85,000 miles, for his old bearings were dry. A third had rear-wheel-bearing failure at only 46,000 miles.

I think Detroit should build cars for careful, sensible owners. These "people-proof" sealed bearings prevent them from getting maximum service, because sensible care is made impossible.

R. S. MORRISON, Delta, Utah.

Dice Make Nice Table Top

IN YOUR "PS Readers Talk Back" section [Aug.] Rubin Levine, Las Vegas, wants some use for discarded dice. They make a nice table top, either sawed in half or used whole.

H. N. GAY, Wichita Falls, Tex.

. . . IN MY younger days we made some nice-looking rings from dice. They should go well in Las Vegas.

M. J. PITASSI, Villa Park, Ill.

. . . HAS Rubin Levine thought of drilling holes in his salvaged dice and wiring them together to form a trivet or plant stand? Or he might cement them to squares of plywood.

JAY ALCOTT, Philadelphia.

Just Don't Drive in the Rain

MAY I put in a word about horizontal windshield wipers ["New Ideas from the Inventors," Aug.]. These may wipe

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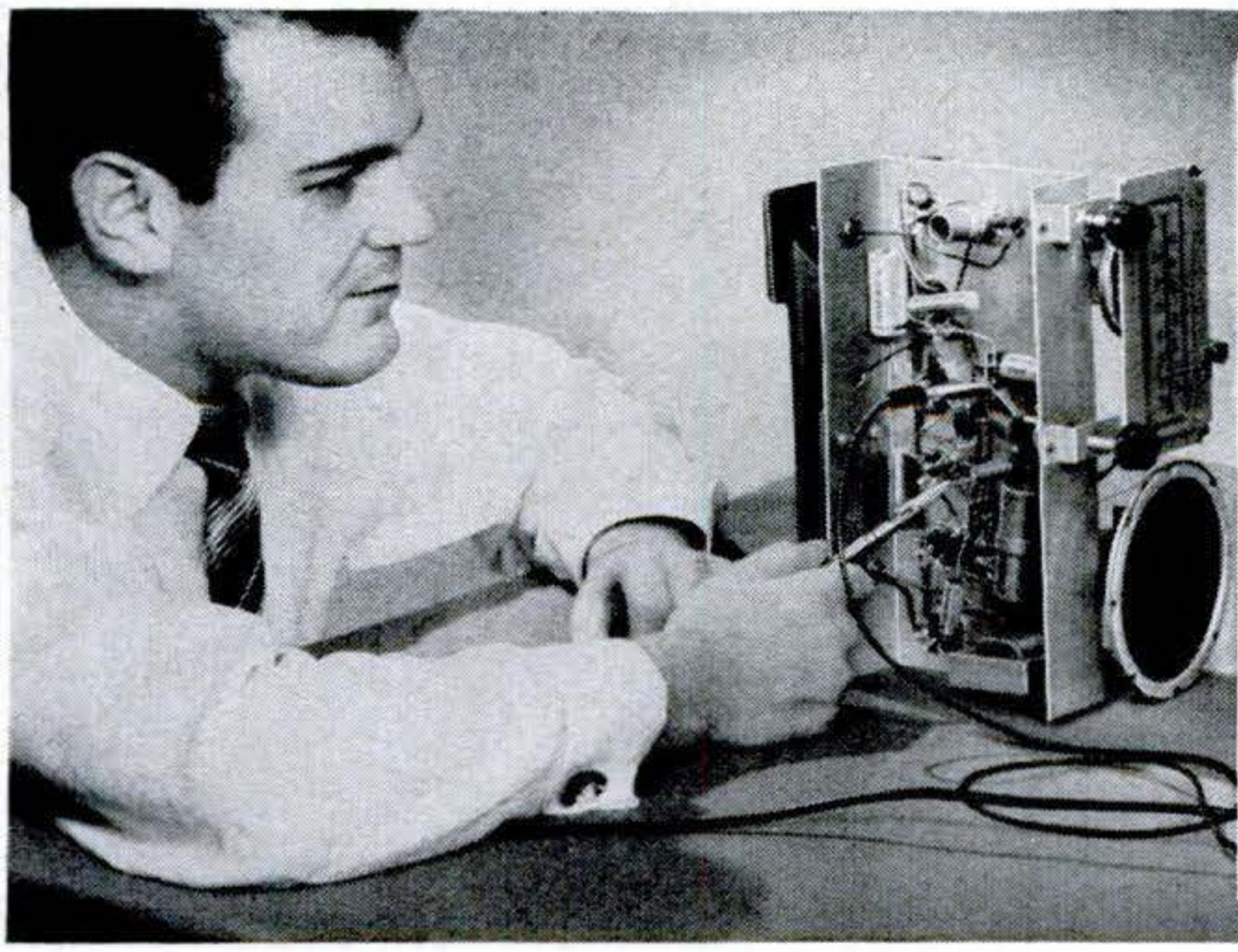
For a Successful Career in Radio-Television Electronics



Train at Home in Spare Time with N. R. I.

OLDEST and LARGEST

Home Study Radio-Television School

N.R.I. Trained These Men

ENGINEER STATION WHPE

"Thanks to NRI, I operated a successful Radio repair shop. Now I am an engineer for WHPE." VAN W. WORKMAN, HIGH POINT, NORTH CAROLINA

QUICK SPARE TIME CASH

"Knew nothing about Radio-TV when I enrolled. After 15 lessons started repairing sets. My future looks bright." DONALD B. ACKERMAN, MINNEAPOLIS, MINNESOTA

HAS OWN TV BUSINESS

"Quit my job to do Television work full time. I love it and do all right financially." WILLIAM F. KLINE, CINCINNATI, OHIO

Prosperous Fast Growing Industry Offers You GOOD PAY-BRIGHT FUTURE-SUCCESS

It's the trained man who gets ahead—gets the better job, drives a better car, lives in a better home, is respected for what he knows and can do. For a job with a future—find out how you can train at home for Radio-Television.

TODAY'S OPPORTUNITY FIELD

Training PLUS OPPORTUNITY is the ideal combination for success. And today's OPPORTUNITY field is Radio-Television. Over 125 million home Radios plus 30 million sets in cars, plus 40 million TV sets mean big money for trained Technicians. More than 4,000 Radio and TV broadcasting stations offer interesting and important positions. Color television, portable TV sets, Hi-Fi, assure future growth. Find out about NRI. Since 1914—for more than 40 years—NRI has been training ambitious men at home in spare time for Radio-TV. With NRI 50-50 method, you study basic principles AND learn by practicing with actual equipment NRI furnishes. You learn with your hands and your head. You get dependable training, backed up by the reputation of the oldest and largest home study Radio-TV school.

ADD TO YOUR INCOME SOON $10-$15 A WEEK IN SPARE TIME

Soon after enrolling many start earning extra money fixing sets. Many open their own full time Radio-TV shops after getting NRI Diploma. MAIL COUPON. Get FREE Sample Lesson and 64-page Catalog showing equipment supplied, outlines of courses, opportunities in Radio-TV. Price is low—terms easy. Address: **NATIONAL RADIO INSTITUTE, Dept. 9MB, Washington 16, D. C.**

Without Extra Charge NRI Sends Equipment You Need to Get Practical Experience

Nothing takes the place of practical experience. That's why NRI training is Learning-by-Doing. With Servicing Course you build Radio shown at top and other equipment. With Communications Course you build Transmitters at left and other equipment. Catalog shows all equipment you get.

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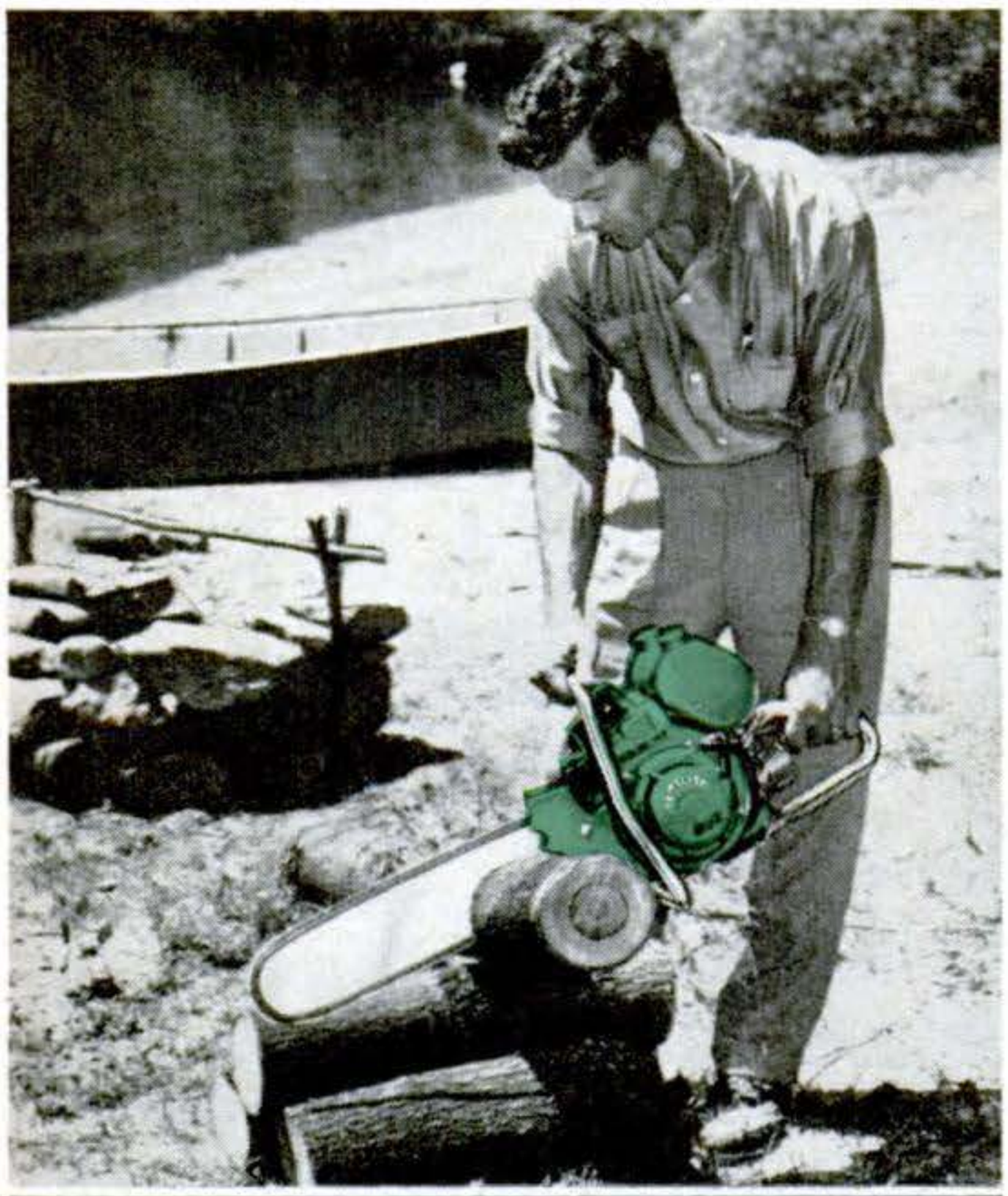
"My New Homelite Cuts Like a Dream"



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after small down payment

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- 19 pounds, less bar and chain
- cuts trees up to 3 feet in diameter
- famous Homelite short stroke engine design
- perfect for cutting firewood, clearing campsites, cutting logs for cabins

PROOF — Robert C. Giltz of Toledo, Ohio writes: "My new Homelite cuts like a dream. I really am sold on it." See a free demonstration at your Homelite dealer's. Send 10¢ for your copy of a new 16-page booklet — "A Man's Guide to Chain Saws."

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A DIVISION OF TEXTRON INC.
711 RIVERDALE AVENUE
PORT CHESTER, N. Y.

THINK FIRST OF QUALITY . . . THINK FIRST OF HOMELITE

"blind spots," but on the downstroke water would run down the windshield following the wiper—blinding the driver.

J. H. HEFELFINGER, Levittown, Pa.

Invitation to Thieves?

A WORD of caution on transparent mailboxes [I'd Like to See Them Make, Aug.]. They're an open invitation to mail thieves—especially with government checks. A thief could spot the distinctive brown envelope (showing the green check through its window) from the sidewalk.

FRED H. BACKSTROM, Springfield.

AMPle Explanation

WHEN describing his experiences ["I Lied to a Lie Detector," Aug.], Wesley S. Griswold refers to "just a few millivolts." Since he's speaking of electrical current, this should read "milliamps." Volts are not a measure of current.

R. B. BATTIN, Cocoa Beach, Fla.

Saving Dollars with a Small Car

YOUR discussion on "What You Save with a Small Car" [Aug.] missed up on one advantage that's really appreciated by people who drive into the city often.

Before I bought my Renault I'd never dream of driving into downtown Boston expecting to find a parking space. I paid from $1 to $2 to some lot owner so that I could park my ark from Detroit.

Now that I own a small car, parking fees run to nickels. There always seems to be a spot at a meter that is just big enough for my Renault. I estimate that in the past eight months I've saved between $50 and $60—quite a substantial saving and one that should be added to your list.

C. L. GOULSTON, Dorchester, Mass.

Size Caused Buick's Slump?

THE reason for Buick's slump ["Detroit Report," Sept.] wasn't its conservative appearance. The car was, in fact, coarse, over-chromed, and massive, and looked big for the money. It was purchased not by doctors, but by less-affluent status seekers.

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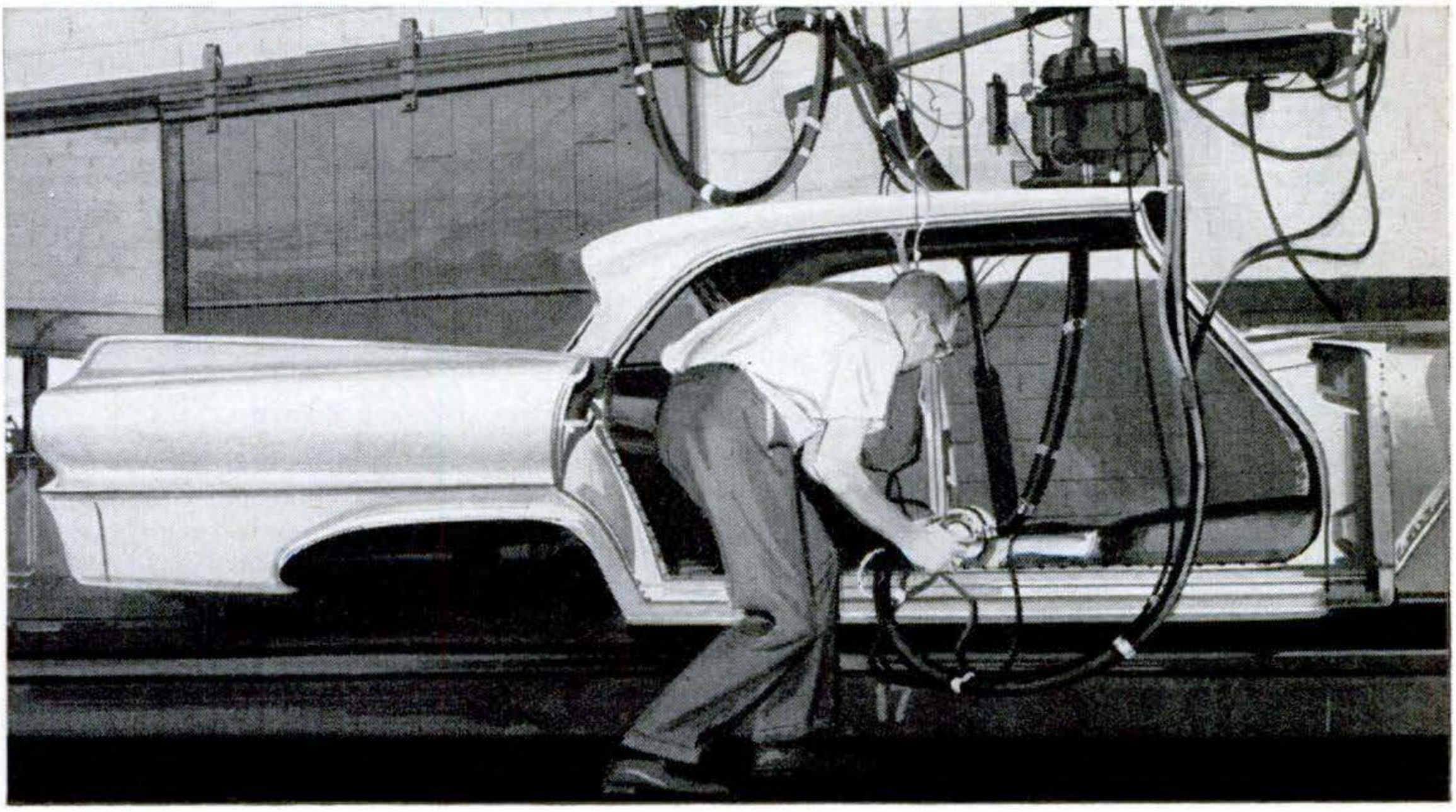
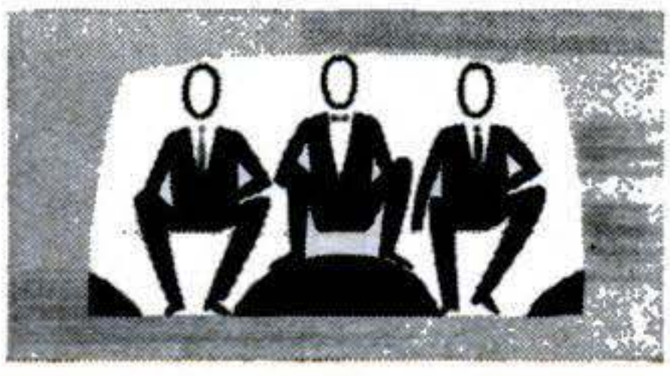
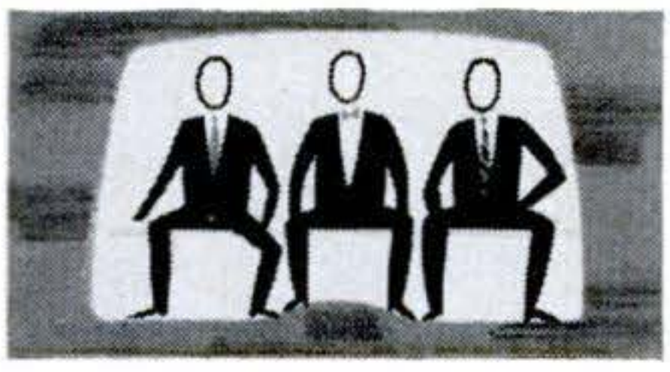
NEW Low-Priced Dodge Dart Features Revolutionary ALL-WELDED Unibody Construction

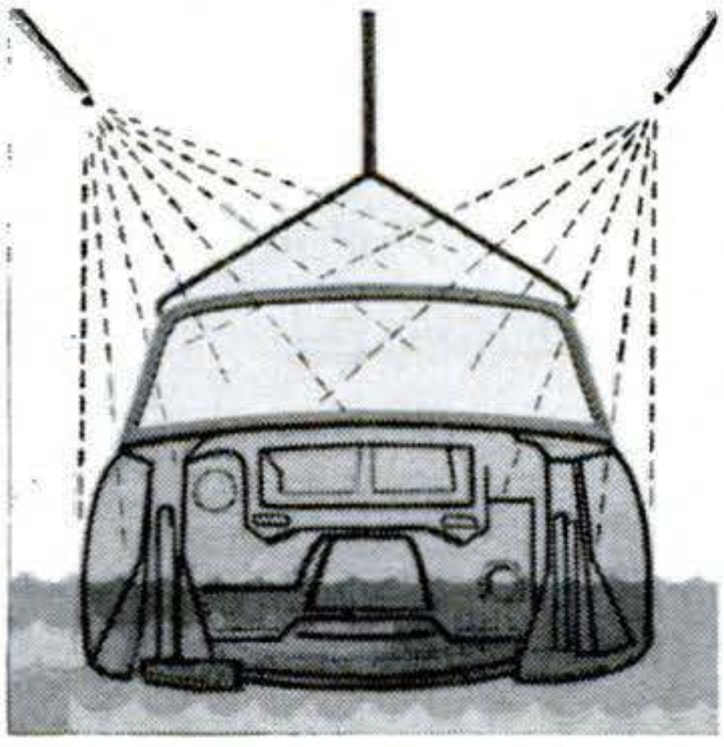


Roominess and riding comfort took a big step forward with the announcement of the new low-priced Dodge Dart. The more efficient one-piece Dart Unibody scored a major breakthrough in boosting interior room and comfort by eliminating space-wasting side rails and crossmembers. Strength and durability are integrated into the body itself. Conventional squeak and rattle-causing attachment of body to external frame eliminated.

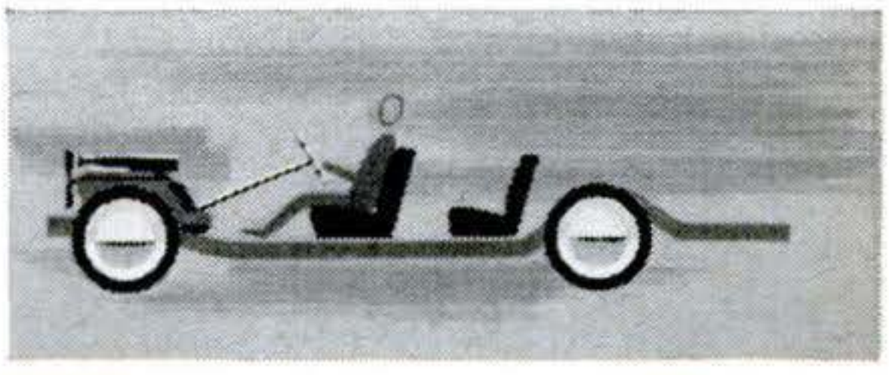


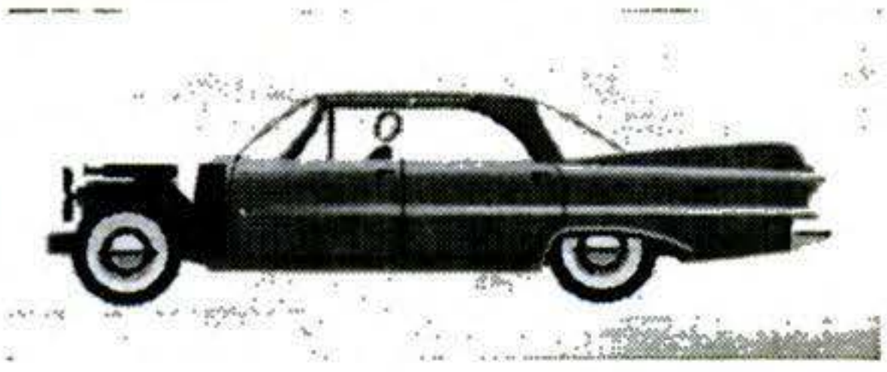


Notice how new integrated strength puts more usable space inside. There's more room for feet, hips, shoulders, hats. Seats are deeper, thicker. Doors are bigger, open wider.



Long-lasting beauty and a higher trade-in value are assured by 7 separate rust-preventive dippings, four sprayed-on coats of primer and Lustre-Bond enamel for a tough fade-free finish.





In conventional body-frame design, strength is concentrated in the frame. Weak body is subject to squeaks, rattles. Unibody equalizes the strength through the entire structure. Body squeaks and rattles are a thing of the past.

AMERICA'S FIRST FINE ECONOMY CAR **DODGE DART**

For the full story on the fabulous Dodge Dart or all-new '60 Dodge, ask for free booklet "The Inside Story on Dodge Cars for 1960." Write Dept. S, Box 1259, Dodge Division, Chrysler Corporation, Detroit, Mich.

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When the 59s came out, they looked no larger than a Chevrolet and not as daring, so the status seekers—Chevy graduates—went to Pontiac and Olds.

P. A. VANCE, Columbia City, Ind.

Rockets Vs. Bullets

MUCH of what you say about the crackdown on amateur rocket shoots ["The Month in Science," Sept.] is true. I've built and fired about 100 small, solid-propellant rockets. If you are careful, this is no more dangerous than deer hunting; less so—the "woods" aren't full of other rocketmen.

HARRY NEUMAN JR., Traverse City, Mich.

On Removing a Floor Board

THAT easy way of replacing a board in a floor [Aug., p. 167] needs qualification. A nail-cutting blade in an electric handsaw will cut through the tongue of the damaged board and the nail only if regular steel nails were used in the flooring. If hardened-steel, helically threaded nails were used, the metal-cutting blade won't do the job.

R. C. HODGE, Cambria, Va.

A Photo Fan Speaks Up

MY THANKS for the fine article, "The Way I Shoot Motorcycle Races" [Aug.].

As an amateur photographer, I found it very valuable. How about some more articles on photography?

RICHARD BAUMAN, So. El Monte, Cal.

Two Engines Missing

"THE Outfit Where Everybody Jumps" [Sept.], shows a picture of a squadron of two-engine Air Force transports on the ground. You call them Hercules C-130s. Isn't the Hercules a four-engine turboprop?

FREDERICK LEE, NYC.

A blushing "yes." The planes shown are Fairchild C-123 Providers, powered by two conventional piston engines.

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Now, with the flick of a match, you install asphalt tile, thaw frozen pipes, solder tools and toys, remove old paint, solder copper tubing — do hundreds of jobs around your home — with the easy-to-use Bernz-O-Matic Torch!

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The Otto Bernz Co., Inc., Rochester, N. Y.

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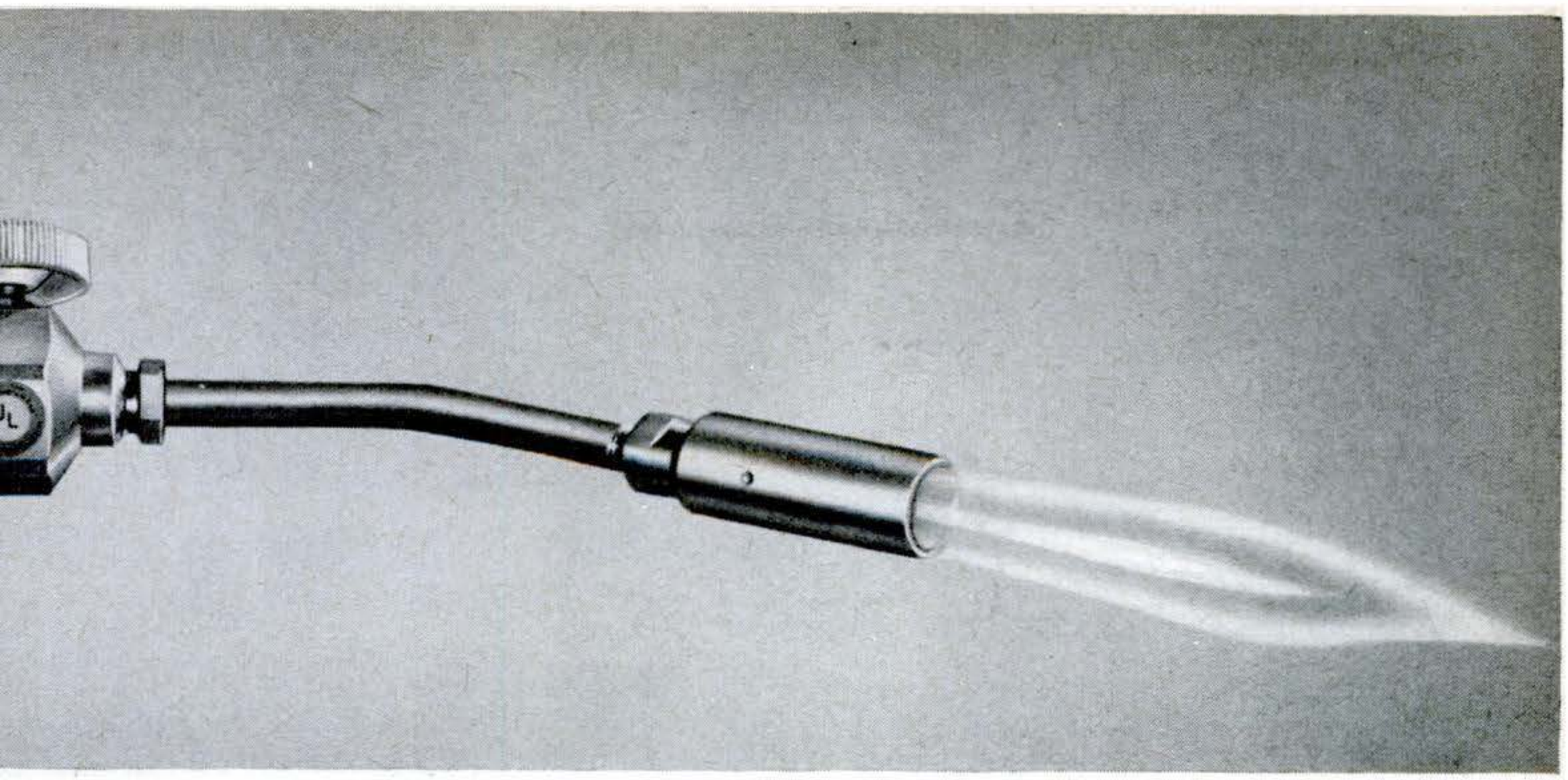

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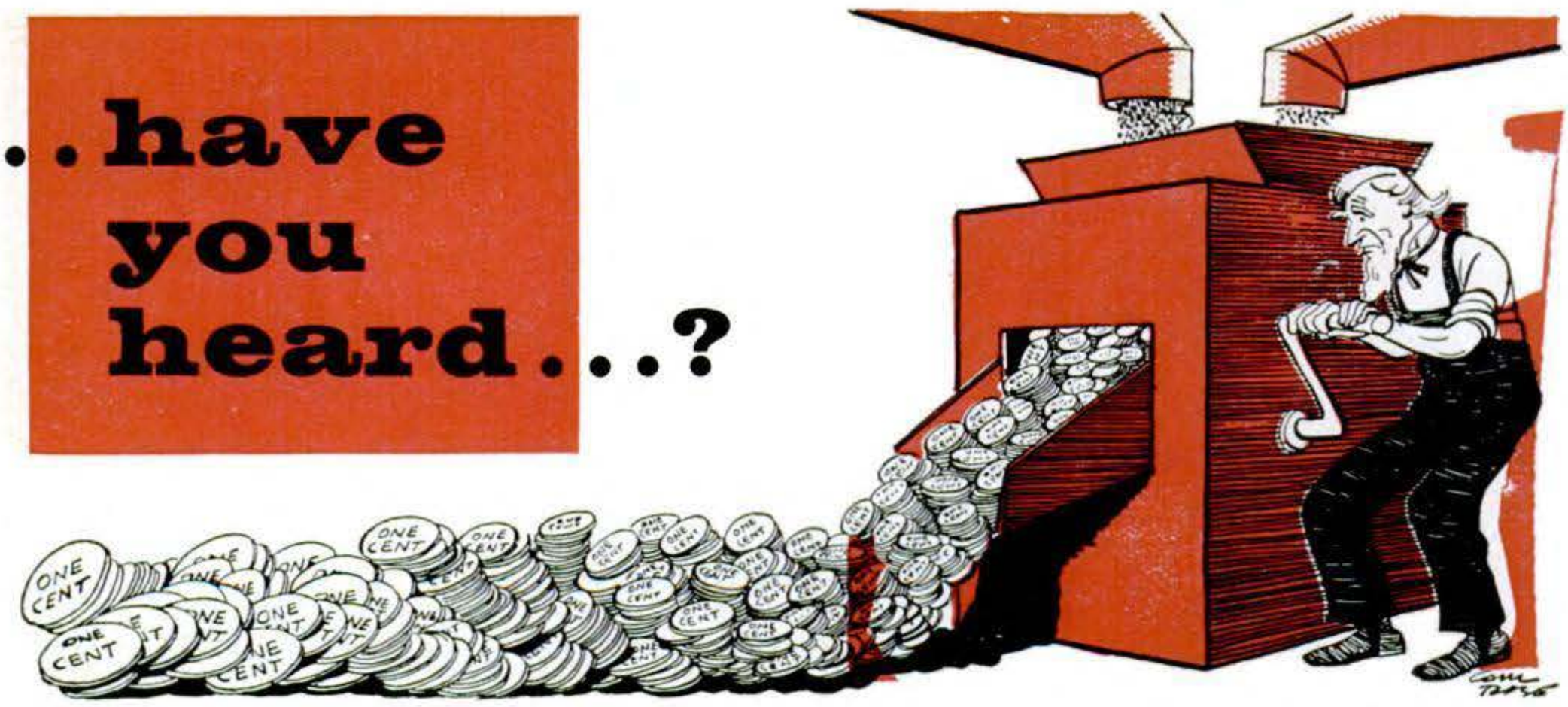

Small change is getting scarce. You can blame it on taxes (more city and state sales levies), automation (more vending machines and parking meters), and sales psychology (more tags that say $19.98).

The Denver Mint, which stamps out $160,000 a day in pennies and nickels, has gone on two 10-hour shifts. The problem is further complicated by strike-caused copper shortages. Pennies are 95 percent copper; nickels 75 percent.

The last time a copper shortage threatened coin production was during the war. The mints made steel pennies then.

The major "cost" of making money is the metal itself. A pound of copper (worth about 30 cents) yields 145 pennies; an ounce of silver (90½ cents) may end up as $1.38 worth of dimes, quarters, or half-dollars. Silver dollars haven't been made since 1935. But there's no shortage: The Denver Mint has 30 million of them tucked away.

Flown in a jet yet? Chances are you will—if a "long journey lies in your future." Jets have boosted air travel to an all-time high. Air now beats sea as the path to Europe and back (568,000 air passengers in the first half of '59 compared with 375,000 sea voyagers).

"Economy" flights have helped, officials say, but the real spurt comes from the jets. Their time-shrinking charms appeal to a vast new market: people who've never flown before.

The load factors tell the story. They're the percentage of available seats that are occupied. For piston planes, load factor is up to 60 percent; for jets it's a whopping 90.

The jet story gets even better with a pat on the back from the Federal Aviation Agency: Jet engines are proving to be 20 times more reliable than piston engines.

The Agency studied the Boeing 707s used by Pan American in its transatlantic flights, and by TWA domestically.

In 10 months Pan Am's jets clocked 64,000 engine hours in service. There were only five "precautionary" shutdowns. TWA's record for five months and 48,000 engine hours was only two shutdowns. Neither airline reported any case of engine fire.

Some of the reasons the engineers give for the greater safety are:

- Simplicity: There are fewer parts, fewer controls to keep track of.
- Wing-suspended engines: Fire hazard is cut by 60 percent.

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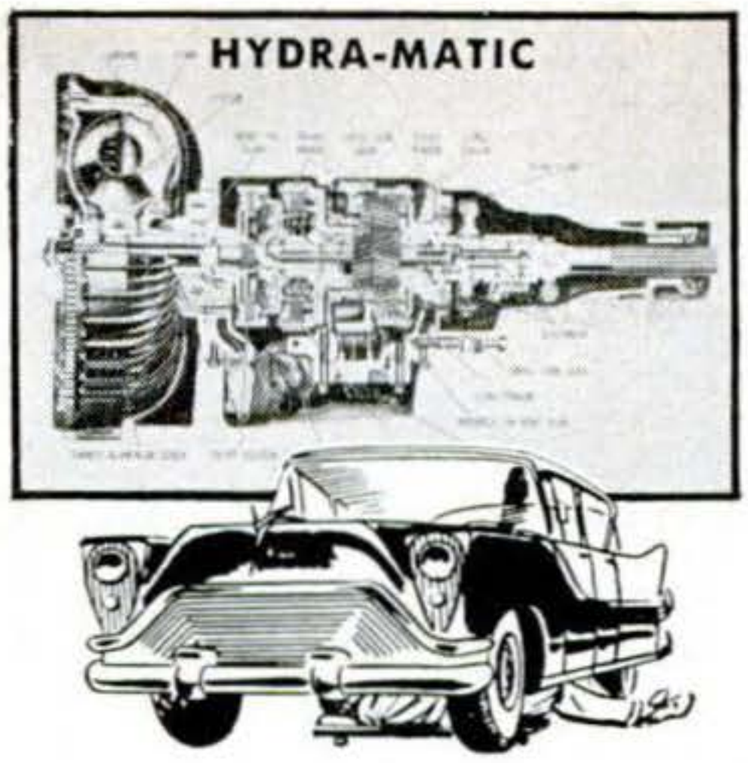

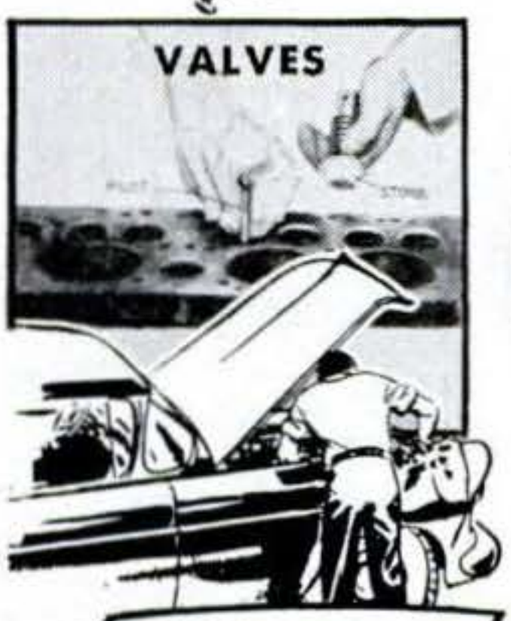

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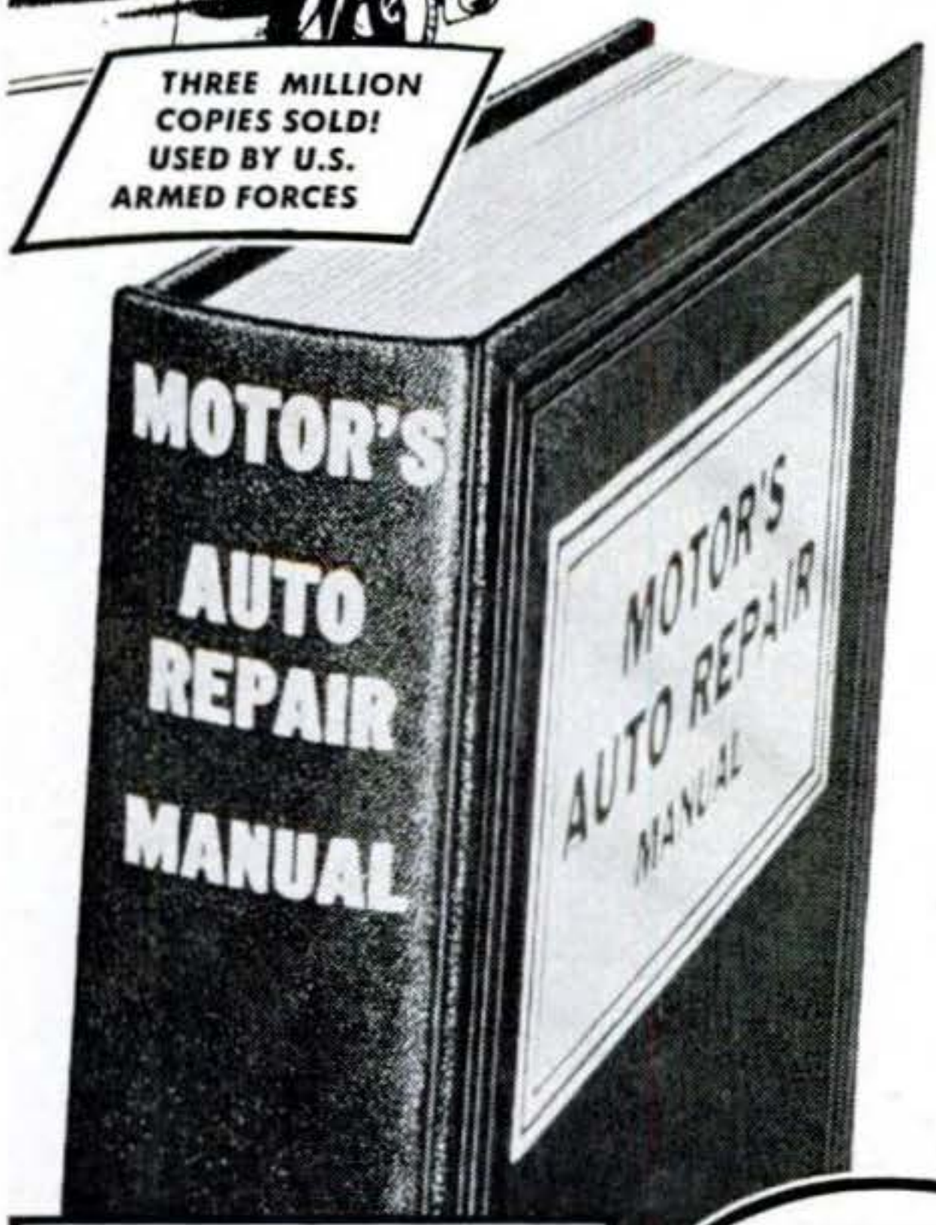

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...have you heard...?

By the end of 1960 there'll be 300 jets in world-wide service (excluding Russia's). One jet can carry as many passengers in a year's time as the Queen Mary. Net result? Not only will you fly a jet yet—but most likely at a lower fare.

If you take a radio along, don't count on listening while you're in the air. The international airlines won't let you turn it on during a flight. Reason? Some sets interfere with a plane's electronic gear.

One AM-FM portable, when switched to FM, upset the pilot's VOR navigation receiver so badly that he couldn't rely on readings when he was more than 25 miles out. But almost any of the communications, navigation or integrated flight-instrument systems aboard can be affected. The needles jiggle and the pilot can't tell whether he's heading the right way—or even if he's flying level.

Interference comes from electromagnetic radiation—radio waves—that all electronic devices produce. Transistor portables are the worst offenders, say the aviation officials. Their circuits are often marginally stable and quick to slip into oscillation.

The ban against playing radios also applies to all other kinds of personal electronic gear with one exception: Hearing aids are okay.

So far an official rule has been adopted only by international lines. But domestic operators have been urged to enact a similar prohibition.

Who owns foreign cars? Tracing 10,000 purchasers of foreign cars, the National Automobile Dealers Association found that:

Financially, they're a pretty well-fixed group. Half make under, half over, $8,000 a year.

Nonetheless they bought imports for economy's sake. Average "small car" price was $2,196. Gas economy was cited by 88 percent as their prime motive.

They're well educated. Only three percent failed to attend high school; 69 percent spent some time in college. They're young, too. Average age was 37.

For the majority (58 percent), the import was *not* a second car. And 86 percent said they'd buy foreign again.

Yes, Smell-O-Vision is here. Film makers have toyed with ways to add smell to sight and sound in movies for years. Now Michael Todd Jr. thinks he has the answer. He's chosen the name purposely, he says, "to get the jump on those who will call it that anyway."

The new process will perfume the film, "Scent of Mystery," to open at a special theater in Chicago. A magnetic track on the film will synchronize action to an "odor machine." Individual odor outlets fixed into each seat will guarantee that the whole audience knows the picture smells.

The odors—all 40 of them—are keyed to scenes varyingly humorous, romantic or suspenseful. The process is a 20-year-old development of a Swiss scientist.

What next? "Feelies"?

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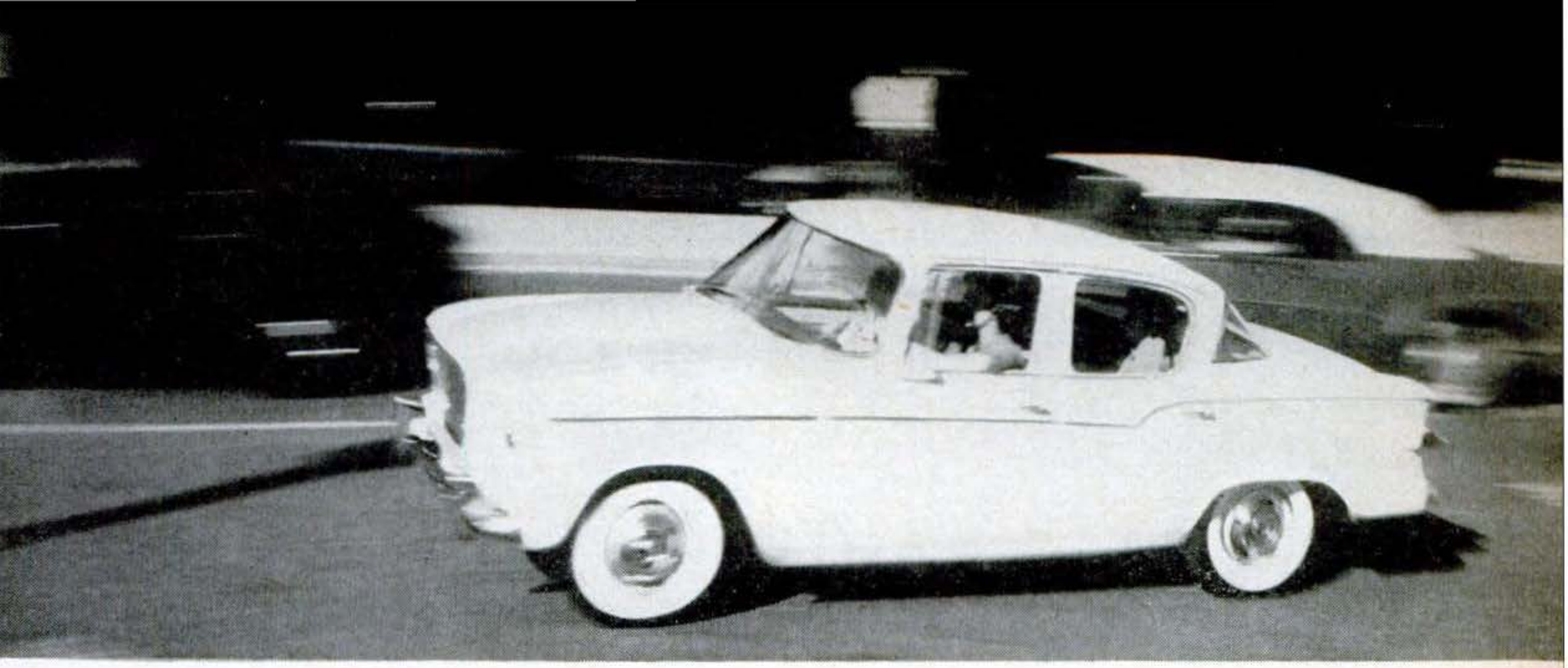

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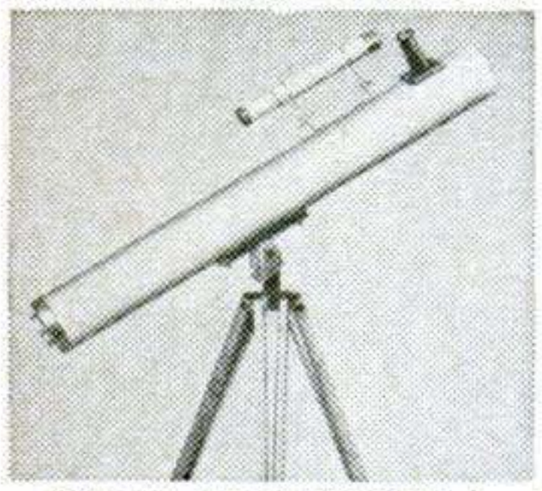

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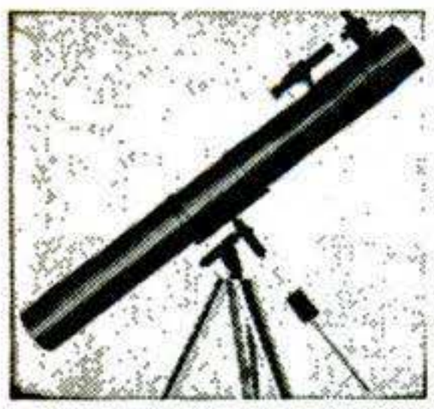

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The month in science

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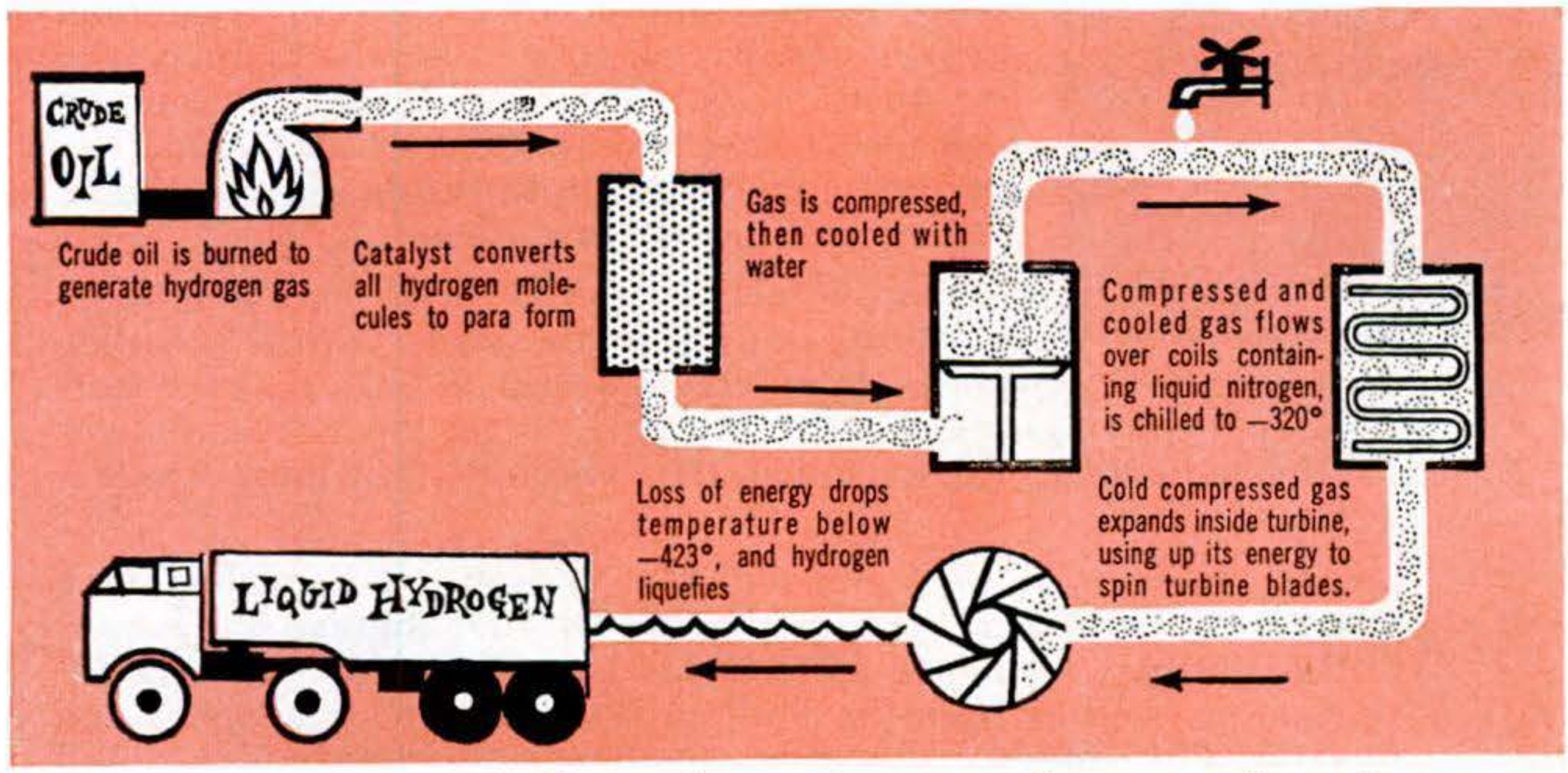
Now Air Products, Inc., rolls big vacuum-bottle trailers of the cold and touchy stuff—many tons every day—out of a Florida plant that qualifies as one of the world's strangest factories.

Hydrogen possesses two unsurpassable advantages:
1. It is the most powerful chemical fuel by far, producing twice as much energy as its closest competitors (beryllium and boron).
2. It is the lightest substance there is. A gallon of liquid weighs half a pound.

Combined, these facts mean that rockets using hydrogen can carry bigger payloads farther. The ideal chemical rocket would burn hydrogen with ozone (the form of oxygen that has three atoms in each molecule instead of the ordinary two). This combination promises a 50-percent boost in performance over lox-kerosene. Even atomic rockets would use hydrogen for the "working fluid," the stuff that gets heated by the atomic furnace and shot out the back to send the rocket forward.

There are also two troubles with liquid hydrogen:
1. It is such a good fuel that it explodes quite readily.
2. It is so cold (minus 423 degrees F.), if put in a metal can, air would freeze solid on the outside. Only liquid helium is colder.

The Florida factory makes hydrogen gas out of crude oil, which is mostly hydrogen and carbon atoms joined into various compounds. The oil is burned to generate hydrogen gas, plus carbon dioxide and carbon monoxide. The carbon monoxide makes



additional hydrogen by combining with steam, taking the oxygen atom out of the H_2O (to become carbon dioxide) and leaving the hydrogen free.

CONTINUED

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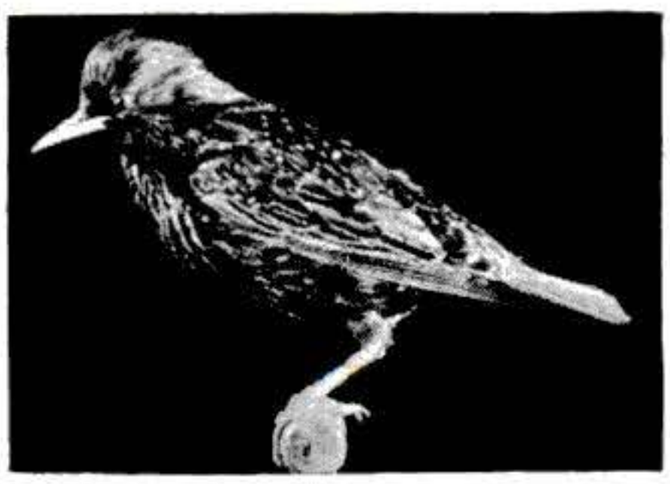
The hydrogen goes through several complex processes to come out the purest ever made—in trade jargon between "six and eight nines," that is, between 99.9999 percent and 99.999999 percent pure. Yet even 100-percent hydrogen wouldn't be good enough because there are two forms of hydrogen molecules. The two atoms that make up a molecule of hydrogen spin, like tops. In ortho hydrogen, both atoms spin in the same direction. In para hydrogen, the atoms spin in opposite directions. This wouldn't matter except that after hydrogen is liquefied the ortho molecules gradually change over to para. When that happens, heat is released. A tank of liquid hydrogen, even if perfectly insulated, would generate so much heat from the ortho-para conversion that the liquid would boil into a gas again. To make sure that the liquid stays liquid, all ortho molecules must be converted to para by running the gas over a chromium oxide catalyst.

Several steps convert the gas into liquid. First it is compressed and cooled with water. Then it's cooled with liquid nitrogen (–320 degrees). The very cold gas is finally allowed to expand in gigantic high-speed turbines. Spinning the turbine wheels uses up energy, which comes from the heat of the hydrogen gas. The temperature of the hydrogen plummets below –423 degrees and it condenses to liquid.

First use of liquid hydrogen will probably be in an engine that Pratt & Whitney is developing for Convair's Centaur. Boosted by an Atlas first stage, Centaur should be able to orbit a satellite weighing four tons.

The Pied Piper of Great Bend, Kan. Modern scientists can orbit satellites, bounce messages off the moon and navigate ships across the ocean underneath the icecap, but when it comes to something really useful like getting rid of starlings, they're stuck.



Starlings are glistening, blue-black birds that roost by the tens of thousands in residential areas in and around cities. Like the humans who live there, they swarm off in the morning to pick up a living and swarm back at night. They produce enough guano to fertilize a plantation. Not even birdlovers love them.

Scarecrow tactics—stuffed owls, shiny aluminum reflectors—don't faze the birds. A real scientific dodge—tape-recorded distress calls that the starlings themselves use to warn the flock to get away from danger—looked promising, but failed, too. The birds just moved over a block or two.

Last summer starling-plagued Mt. Vernon, N. Y., called in a modern Pied Piper. Spry, diminutive Otto D. Standke has chased the starlings from the park in his home town of Great Bend, Kan., as well as from the Federal Buildings in Indianapolis and Louisville. Smoking his cigar, banging aluminum paddles, and intermittently striking a chime hung round his neck, Standke strode Mt. Vernon's streets. The starlings took flight. But they came back.

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And yet, all you do is plug it in to an ordinary wall socket! It uses no electricity — costs you nothing to use — never heats up or wears out — works in absolutely safety! Once you slip it on your set, you never see it or touch it again! *And yet it must give you the TV reception of your life — instantly — on every single channel in your area — OR EVERY CENT OF YOUR MONEY BACK!*

Why Settle for Half-Blurred Pictures! Washed-Out Channels!

Think of it! You probably paid $200, $300, even $400 for your television set! You pay a TV repairman as much as $20 and $30 extra every year, just to keep that set in perfect working order! *And yet, with all the miracles of television electronics . . . despite all the money that you spend on that set . . . THAT TV SET IS ONLY AS GOOD — AND NO BETTER — THAN ITS TV ANTENNA!*

And what kind of antenna do you rely on to bring you in three to four hours of viewing pleasure every evening? If you're like millions of other Americans, especially in apartments, then you paid up to $10 to $15 for an "Indoors, Rabbit-Ears-Type Antenna"! *A WIRE ANTENNA ONLY TWO TO FOUR FEET LONG — and you give it the almost-impossible job of pulling in clear, sharp, brilliant pictures, through concrete and steel, from hundreds of miles away!* No wonder you're always jumping up to adjust it! No wonder your eyes are always tired and smarting at the end of a night's viewing!

Or, you have another choice! You can install a huge, fragile, roof antenna — and pay your landlord $24 a year extra rent, or spend up to $85 to put it in if you own your own house! *And this roof antenna is three, four and five times as effective as any Rabbit Ears — because it has up to TWENTY-FOUR FEET of antenna wire — up to TWENTY-FOUR FEET OF RECEIVING AREA TO PULL IN YOUR PICTURES!*

But these roof antennas are still too easy to bend out of focus — still too vulnerable to damage by wind or storm — still too expensive to repair! After the first heavy storm — again you have the faded channels, muddy pictures, enjoyment cut in half!

But — and read these words carefully — *there was always A THIRD CHOICE FOR AN ANTENNA — a TV Antenna lying hidden, already-made in your home or apartment! A GIGANTIC TELEVISION ANTENNA — not two feet long or twenty feet long — BUT HUNDREDS UPON HUNDREDS OF FEET LONG — woven into the very structure of your apartment or home — and ready to pull in SUPER-STRONG SIGNALS FROM EVERY DIRECTION!*

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But radar screens also have HIGH-FREQUENCY RECEIVING ELEMENTS, that collect these signals and channel them down into the control room, where they can be seen clear and sharp by the men who operate them! WHY NOT USE THE SAME TYPE HIGH-FREQUENCY RECEIVING ELEMENT TO TURN YOUR ORDINARY HOUSE WIRING INTO A SUPER TV ANTENNA!

This is exactly what has happened in the *Mark III Radar Antenna!* Technically speaking, the *Mark III Antenna is an ultra-high-frequency* television antenna, utilizing radar-derived receiving elements, and reinforced by an additional dipole formation to provide the absolute maximum pulling power! It is designed and manufactured by engineers producing radar components for the United States Army, Navy and Air Force! It is a precision-made product of the highest quality possible! Yet its price is only $4.95. Here is how this miracle antenna works! Here are the results you will get on any year, make or model set, OR EVERY CENT OF YOUR MONEY BACK!

Your Family Must Gasp in Astonishment — Or your Full Money Back!

When you receive the *Mark III Radar Antenna,* you can then forget forever about Rabbit Ears, roof antennas, hourly adjustments or antenna repair bills! To install the *Mark III Antenna* on your set — forever — you need only sixty seconds of your time, and a screwdriver. There is no danger — you don't even dirty your hands!

Simply turn your set around; unscrew the present antenna wires and throw them away! Slip on the *Mark III* wires and plug in its cord. Now snap on your set, and turn to the weakest channel! Adjust the dipole elements till that "weak" channel comes in strong and clear, and then you are finished! *That's all you have to do! Every other channel will automatically give you pictures of breath-taking beauty! You will have depth, contrast, sharpness, fidelity of sound that you have never dreamed possible before — OR EVERY CENT OF YOUR MONEY BACK!*

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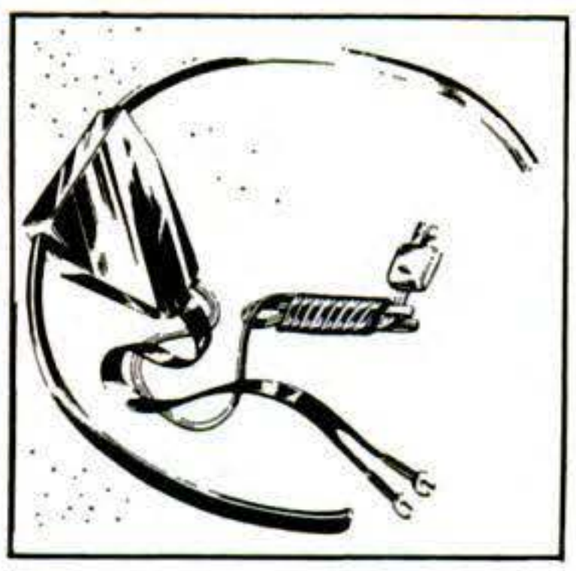

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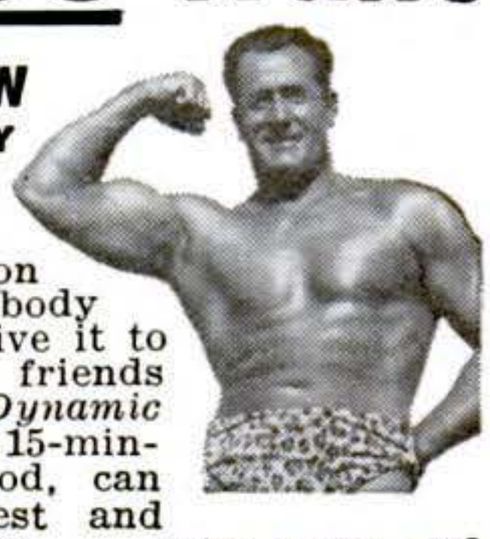

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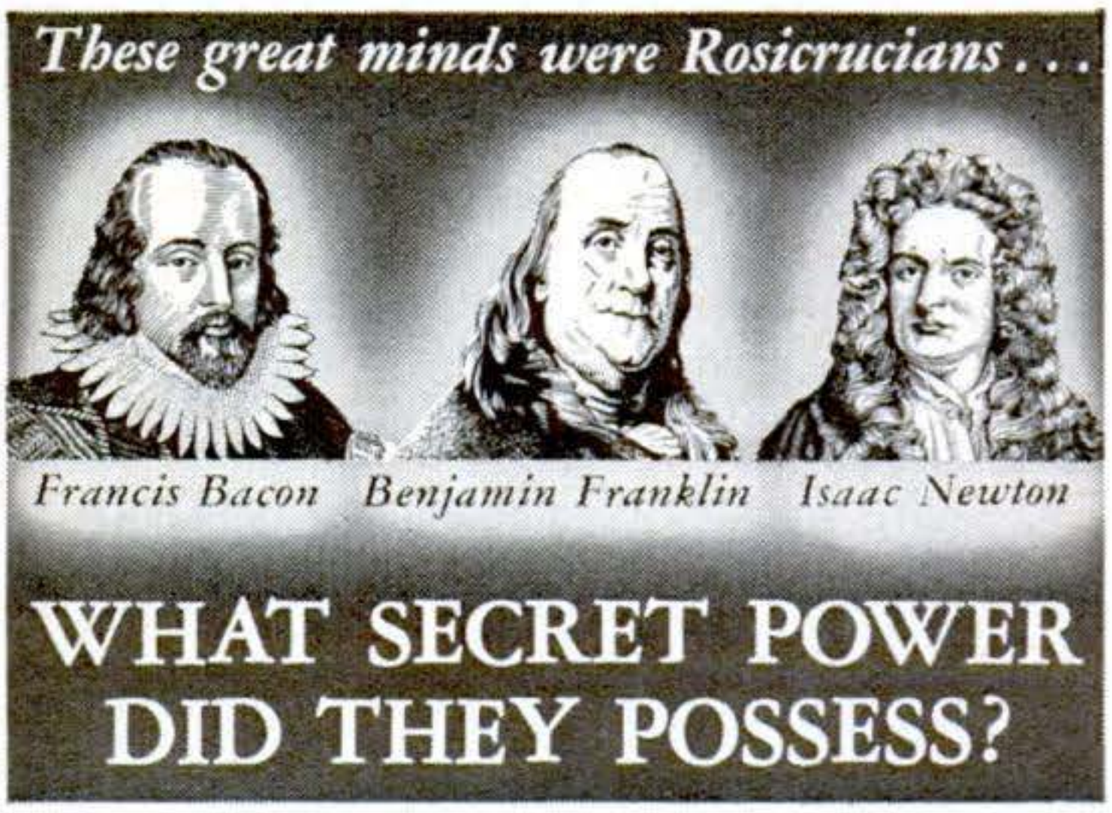

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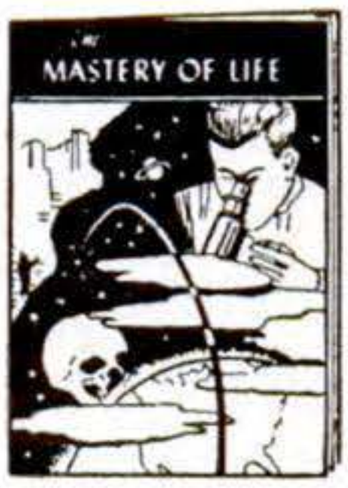

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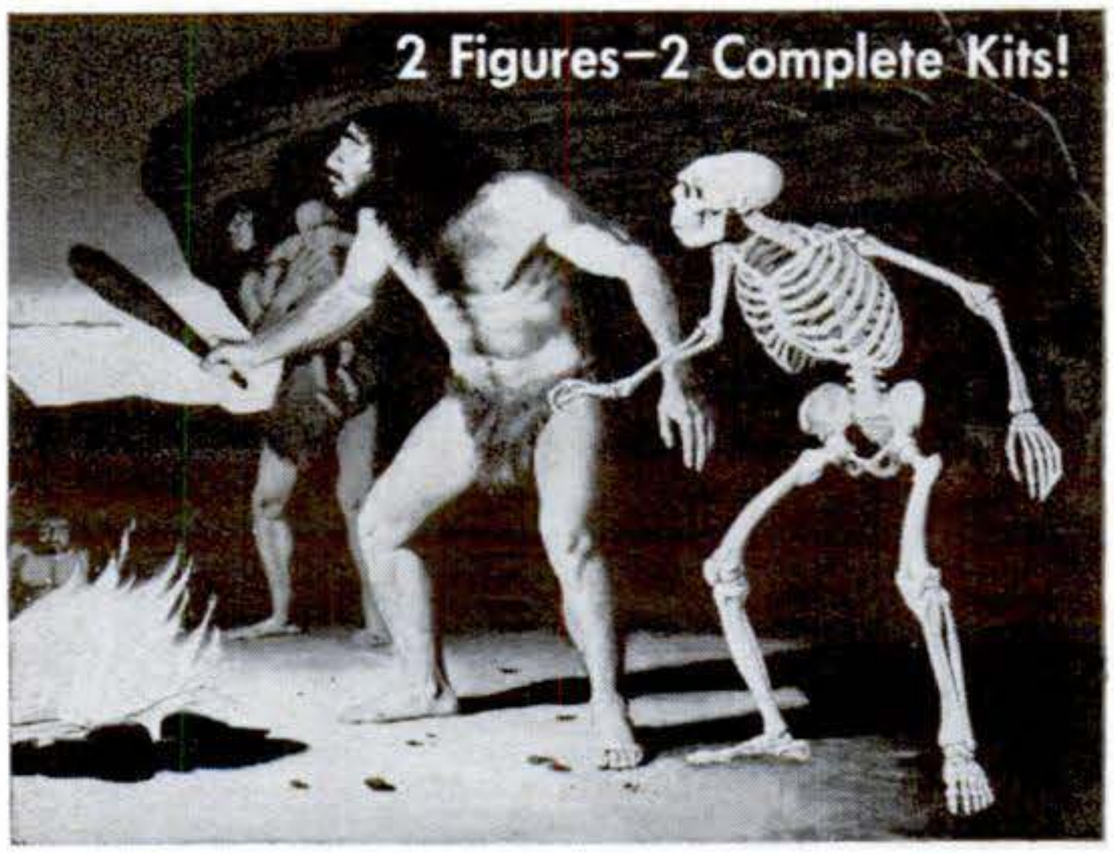

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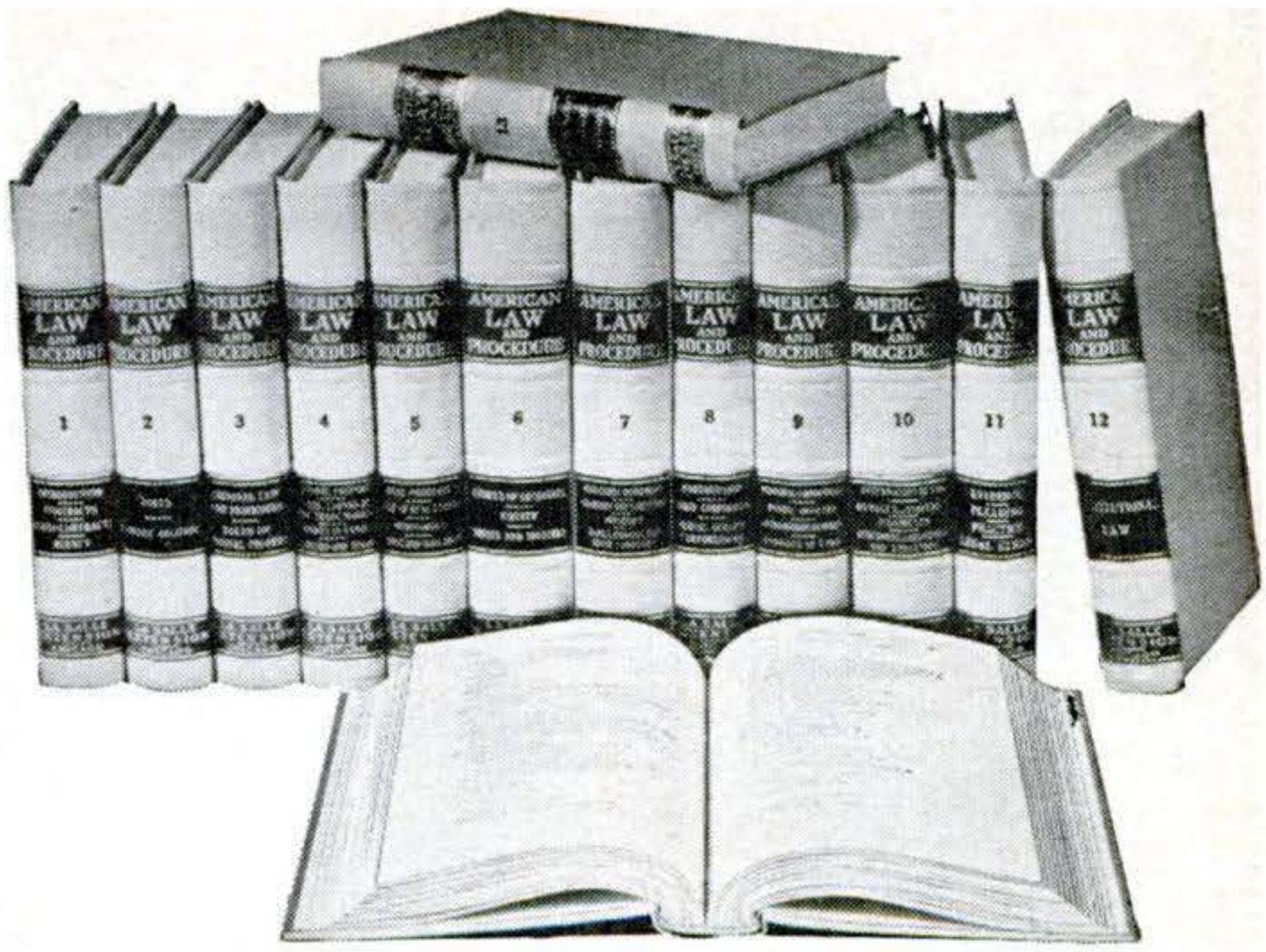

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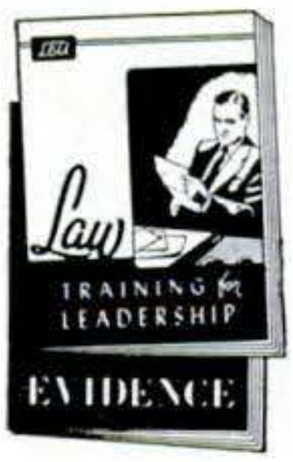

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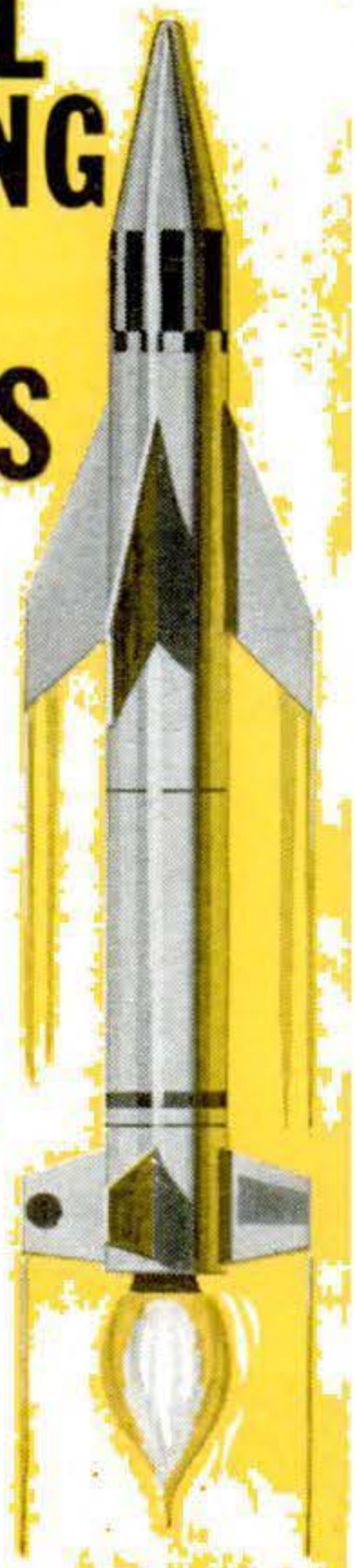

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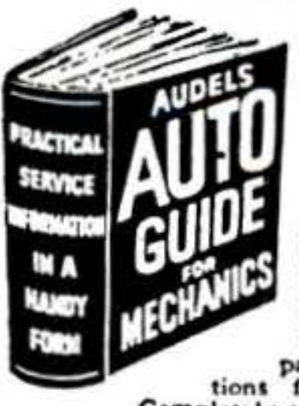

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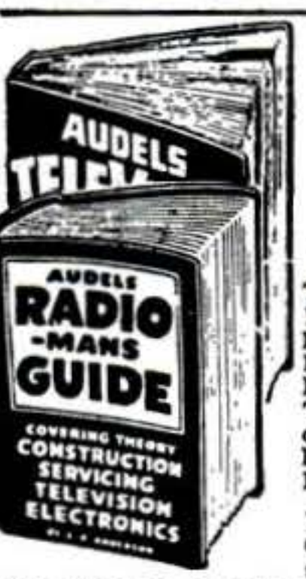

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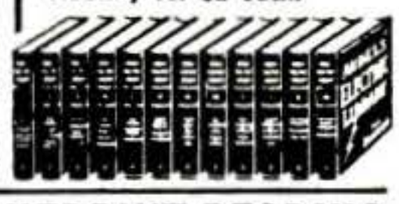

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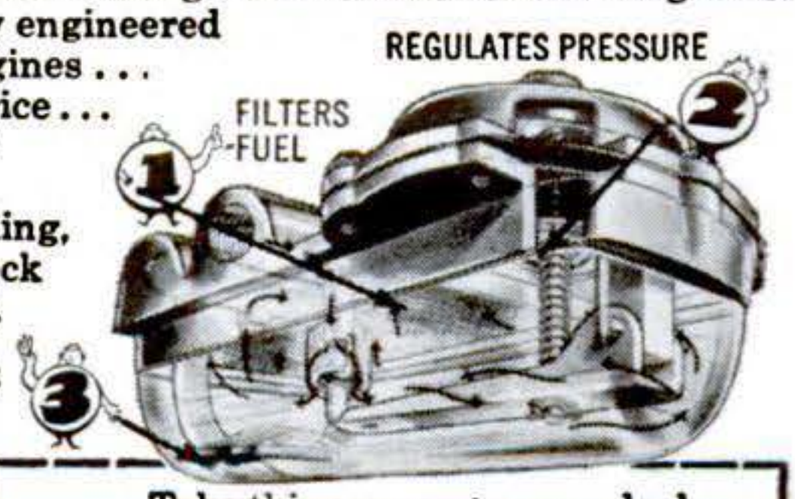

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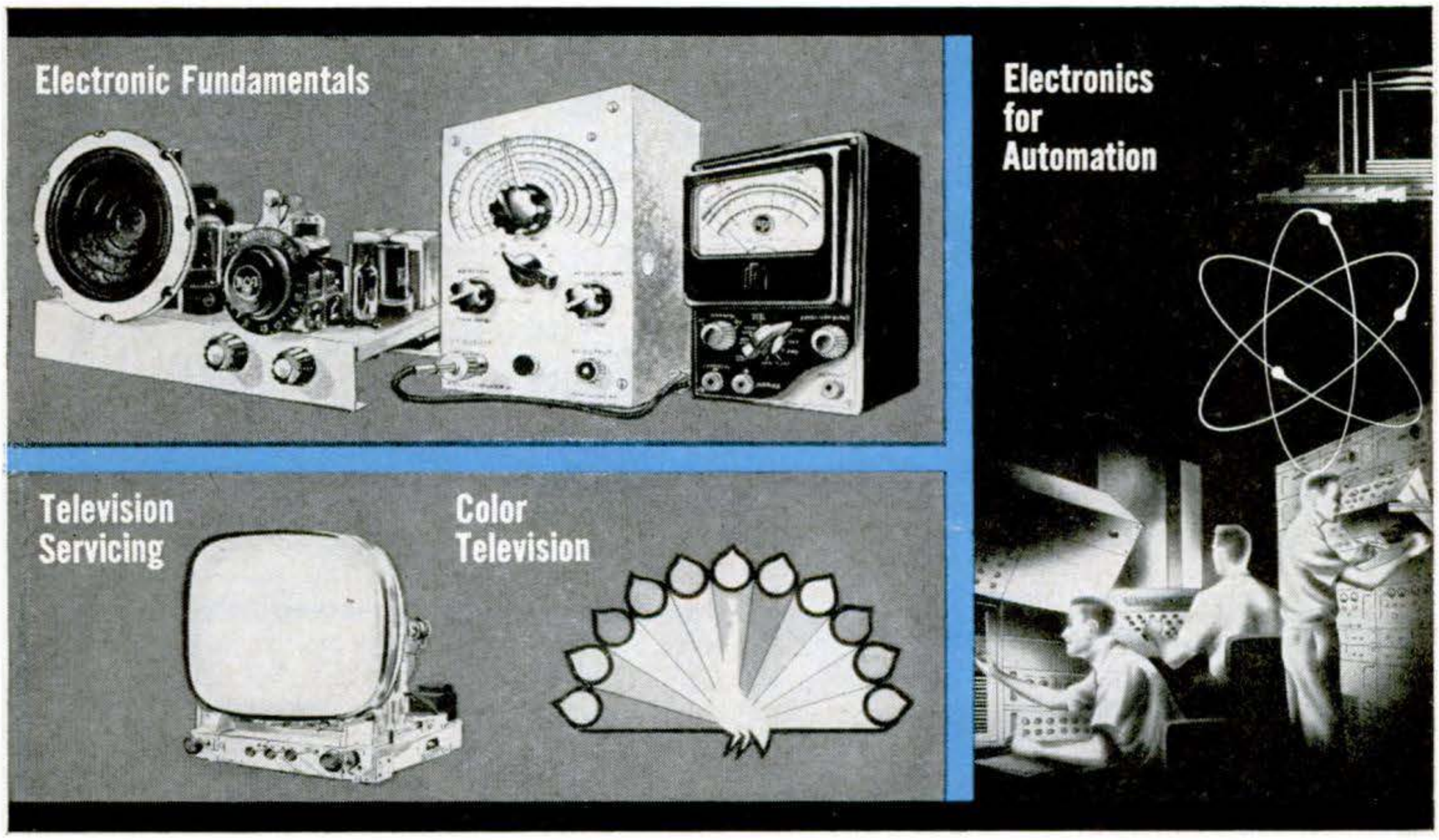

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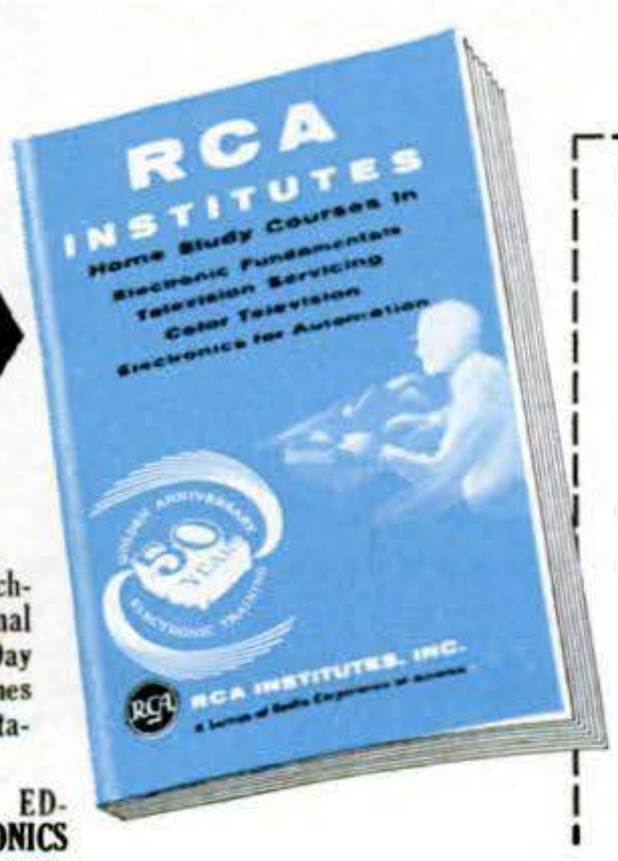

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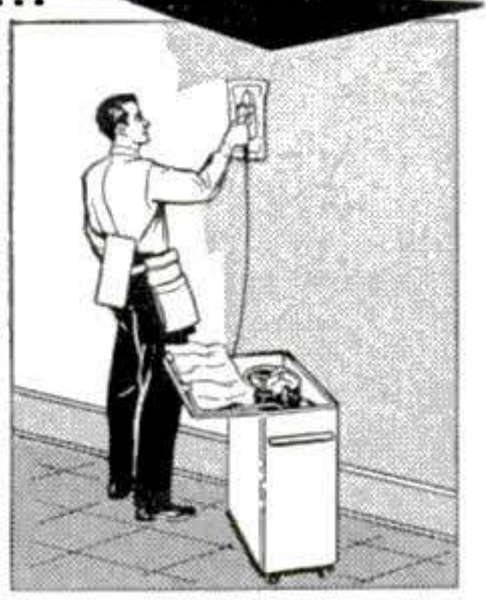

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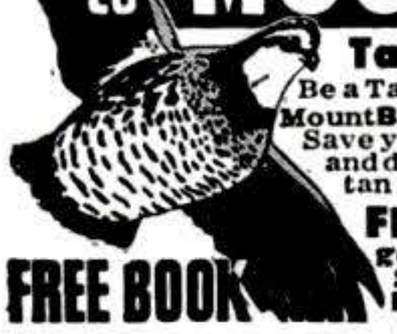

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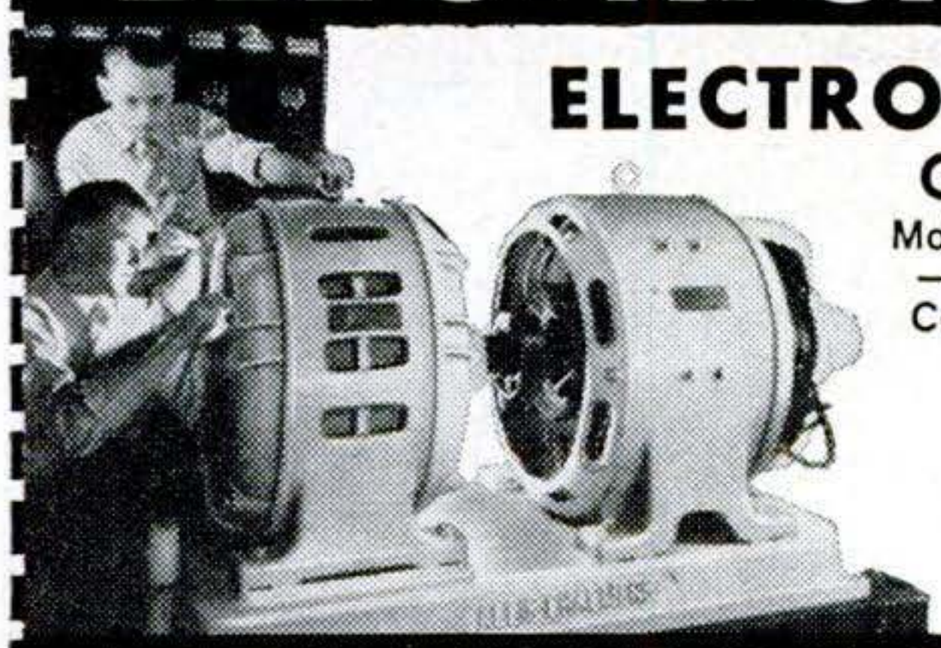

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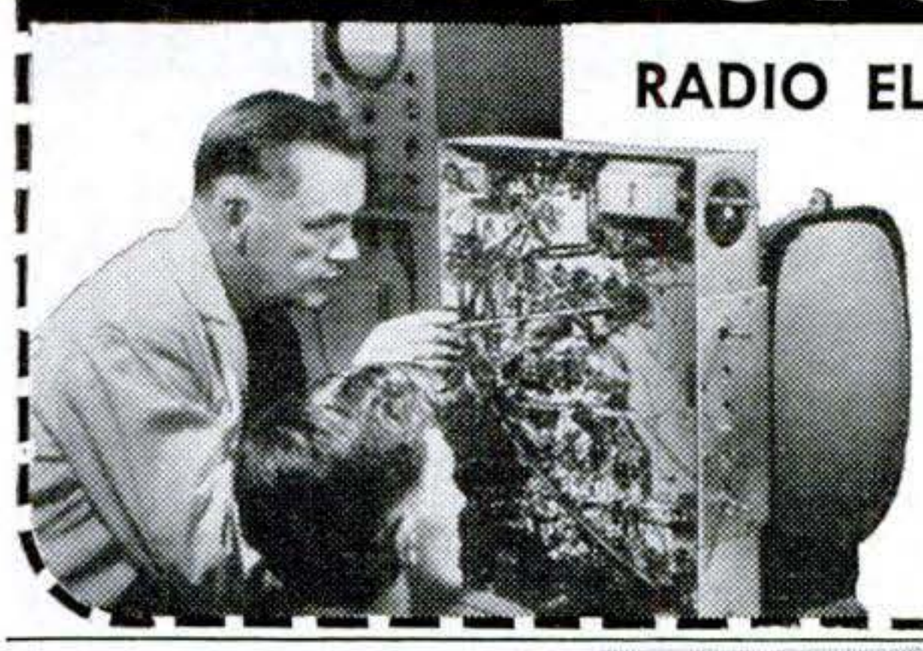

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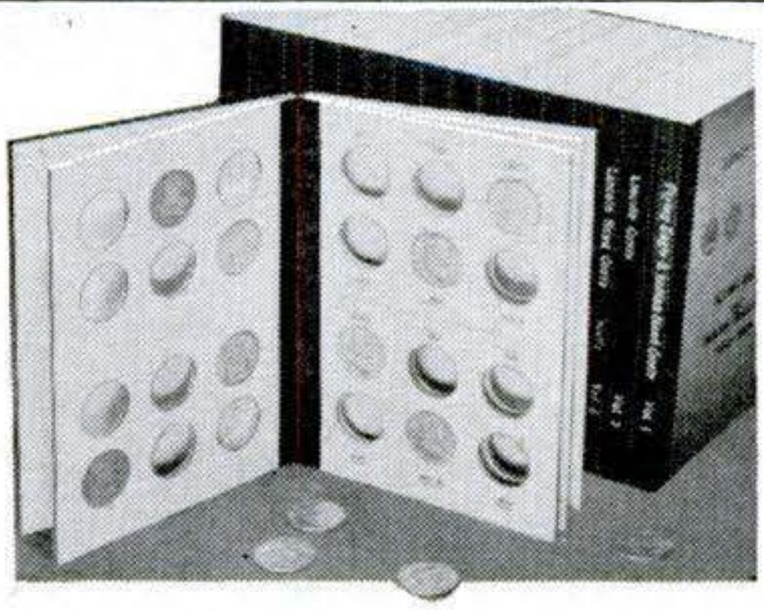

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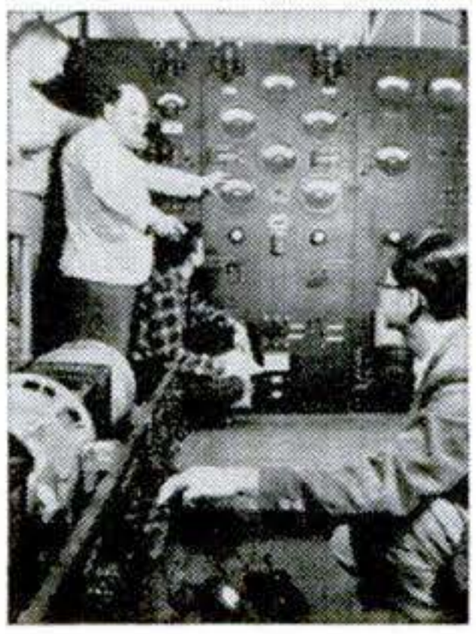

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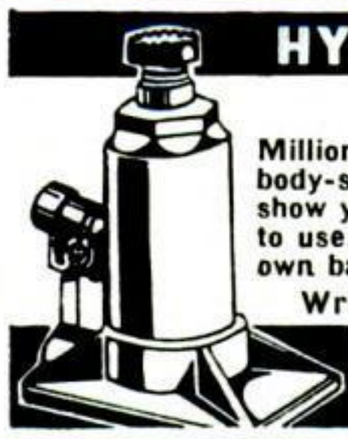

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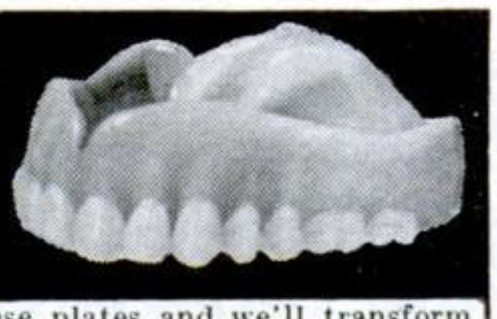

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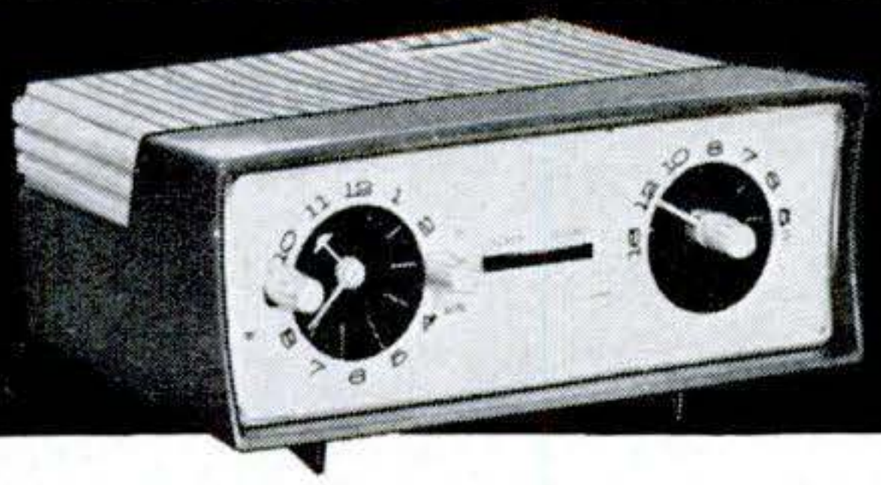

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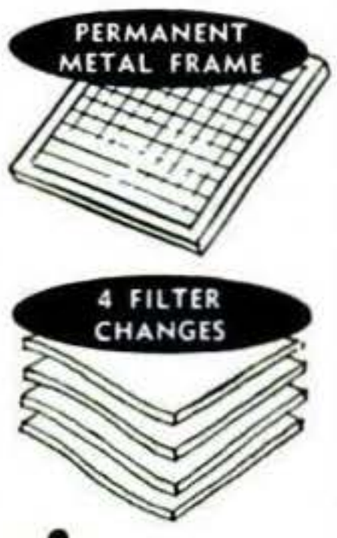

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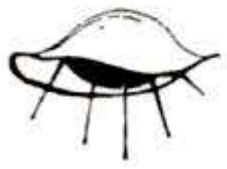

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by Victor B. Mason

Out of the thousands who read this message perhaps only you and a few others will have the vision and the intuition to realize that it may be intended that you read this page at this time—that the coincidence of holding this magazine in your hands may shape your destiny, may guide you to lots of independence beyond the dreams of avarice.

Don't misunderstand me, I am not speaking of mysterious laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish*. If this message is intended for you, you are the kind of man who knows that anything worthwhile must be earned. If the earlier development of your karma has revealed to you that there is no reward without effort, you may now be ready to learn and use the secret I have to impart.

Please don't misunderstand this statement. I am not a philanthropist. Frankly, I am going to charge you something for the secret I give you. Not a lot—but enough to convince me that you are a little above the fellows who merely "wish" for success.

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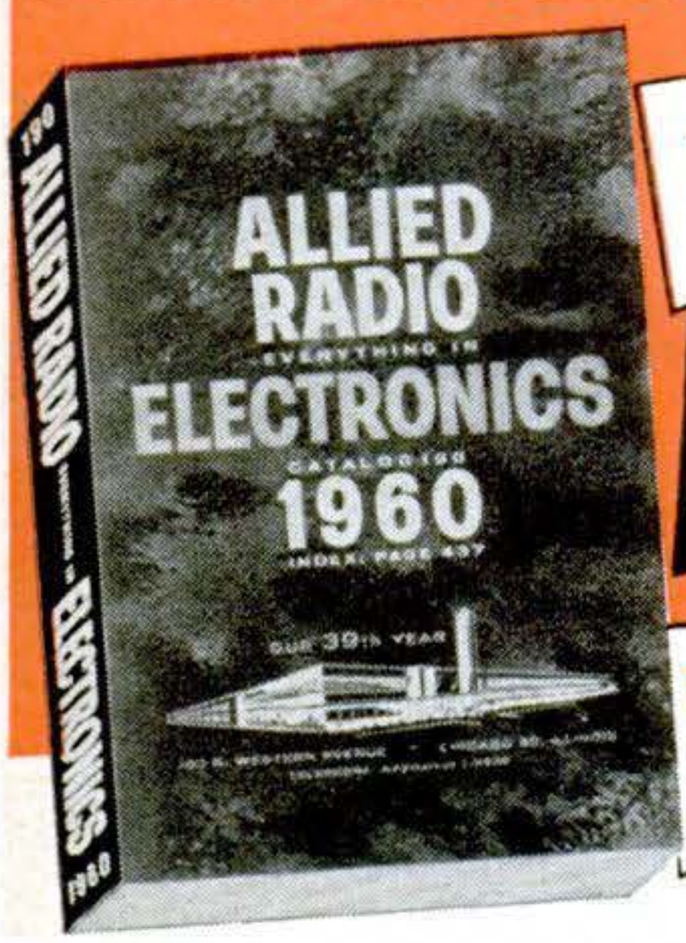

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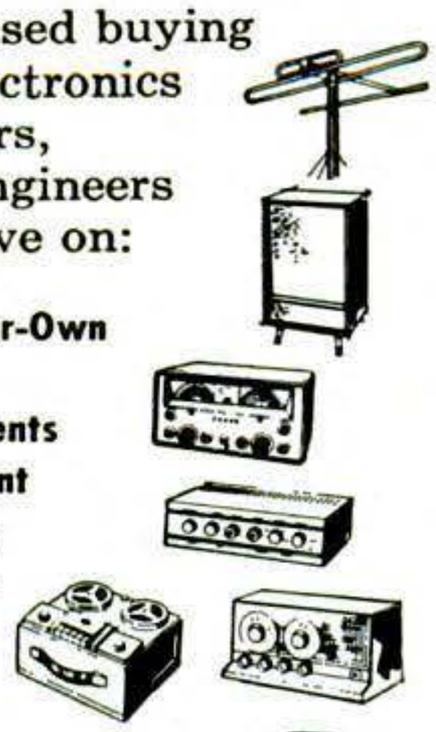

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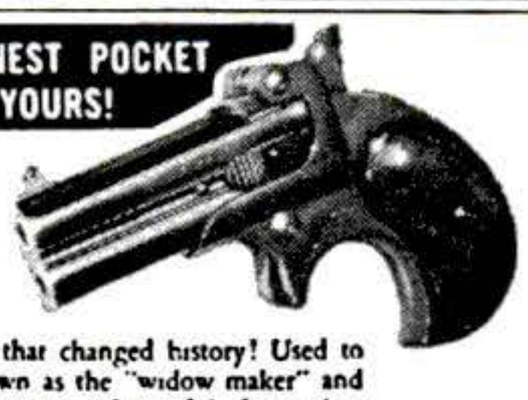

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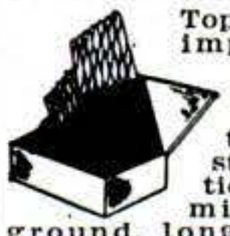

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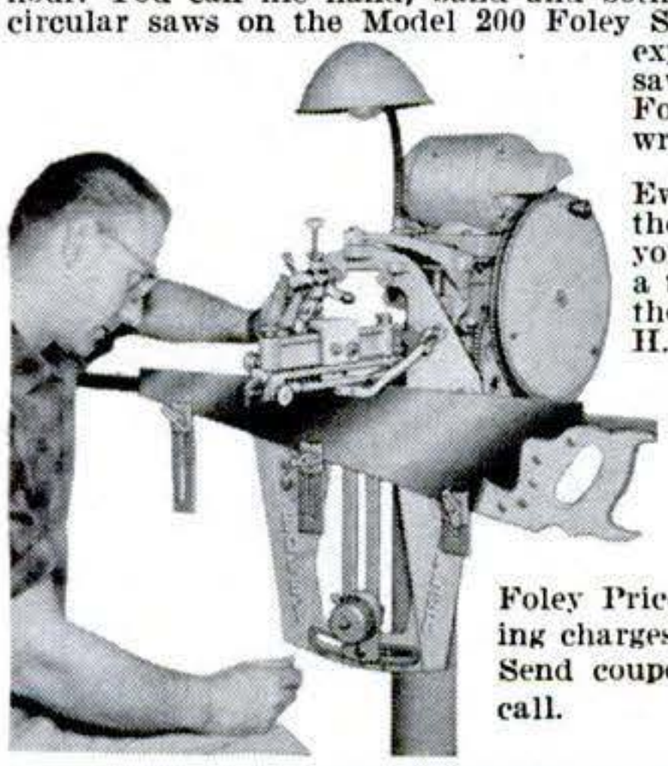

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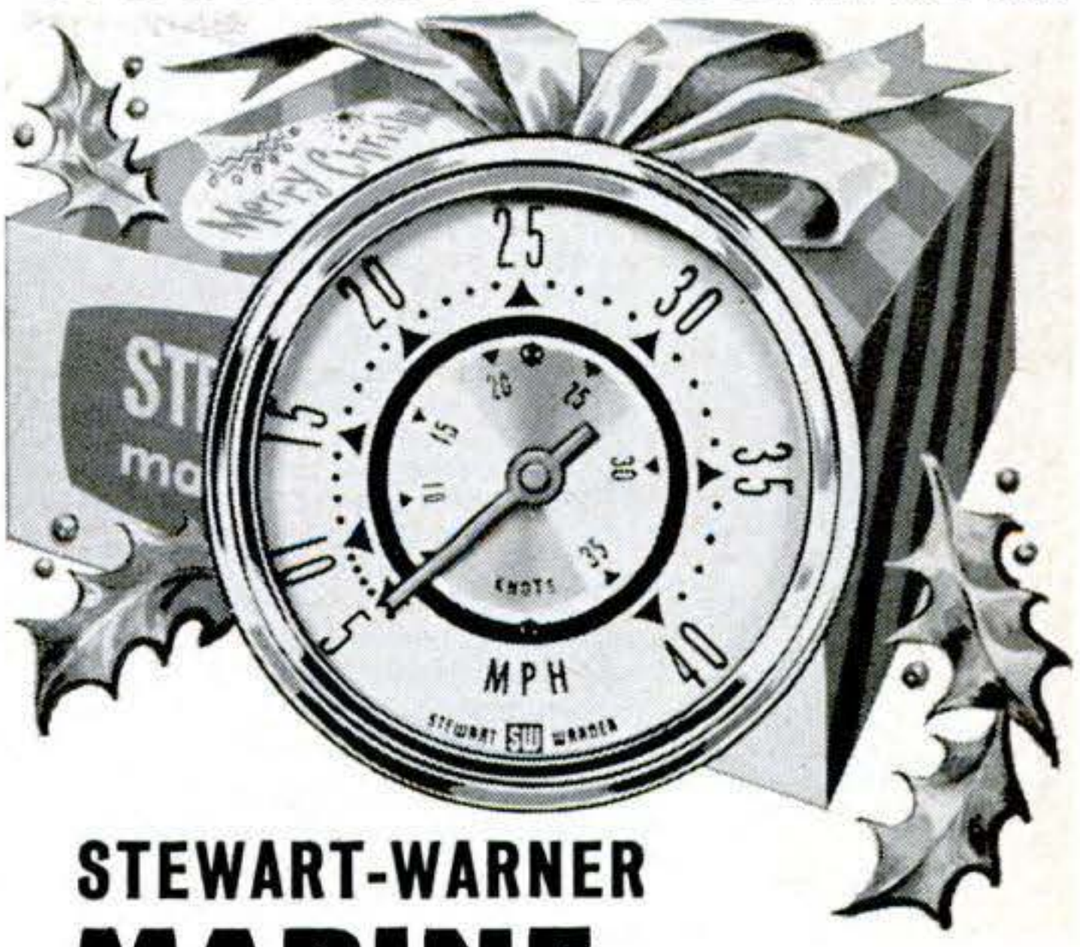

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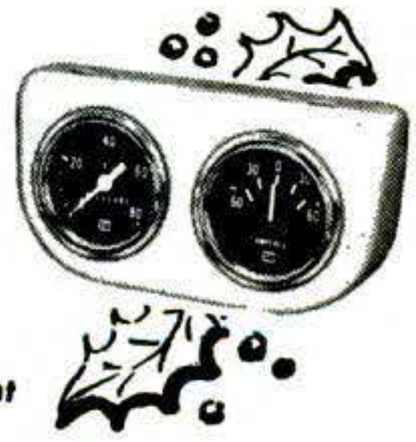

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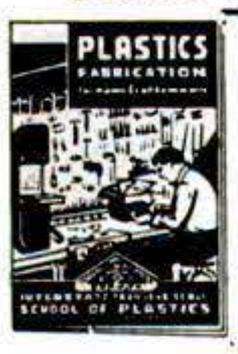

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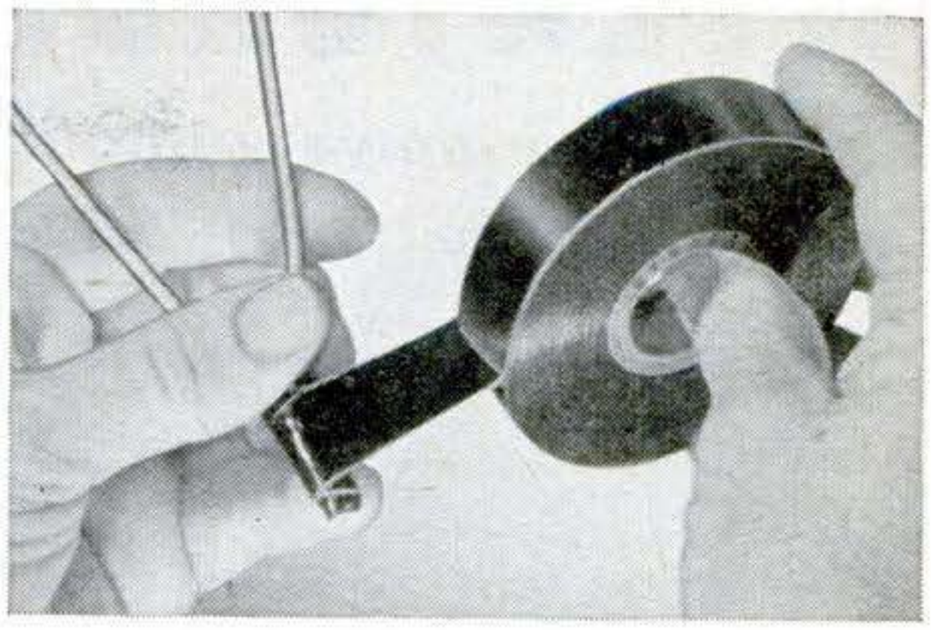

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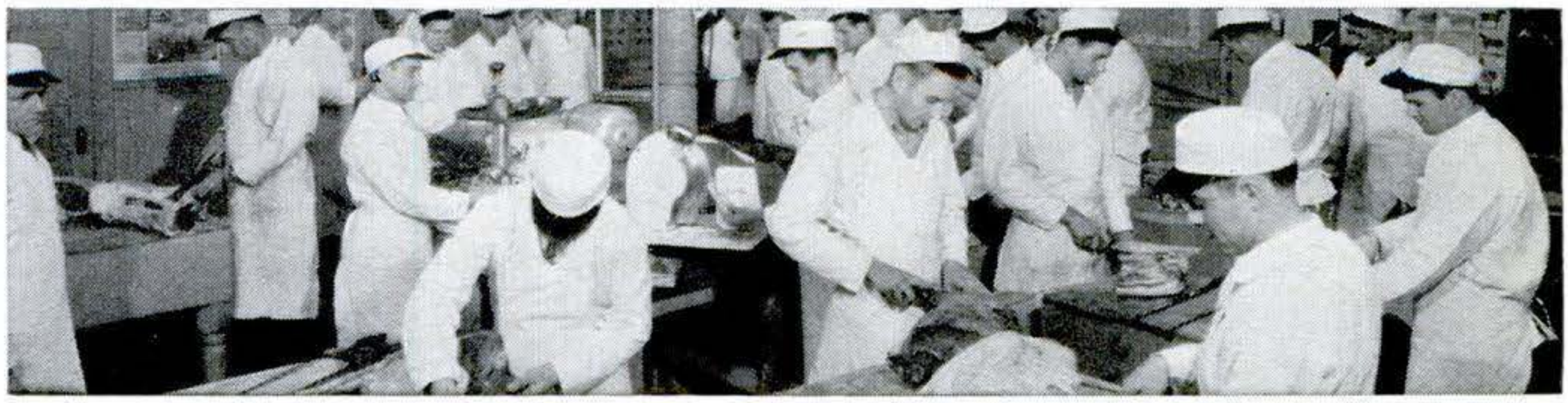

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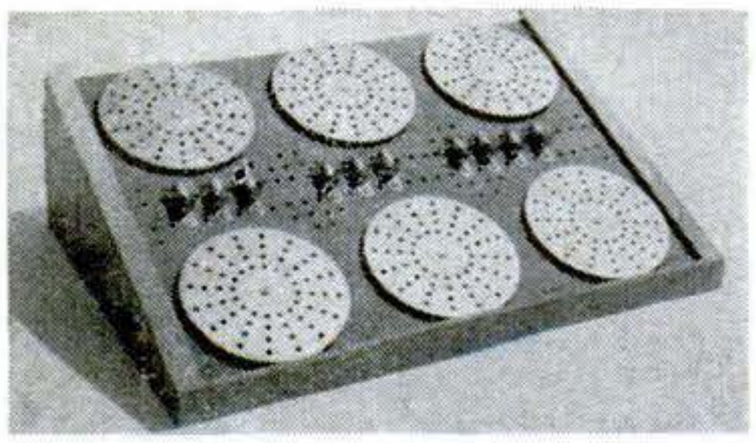

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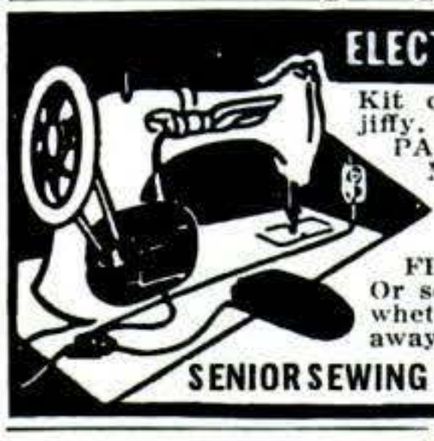

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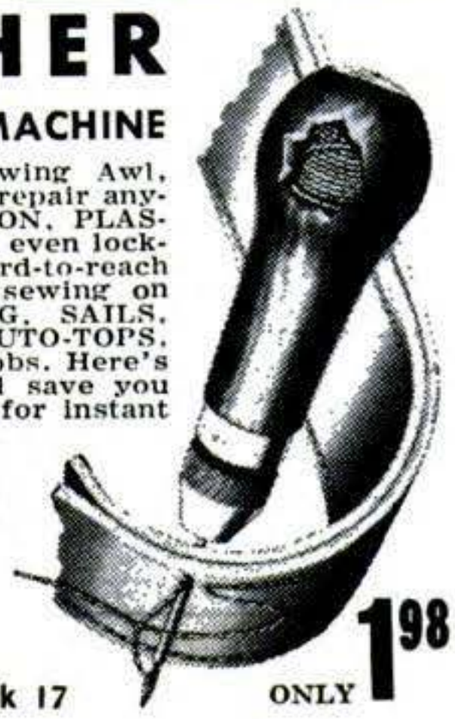

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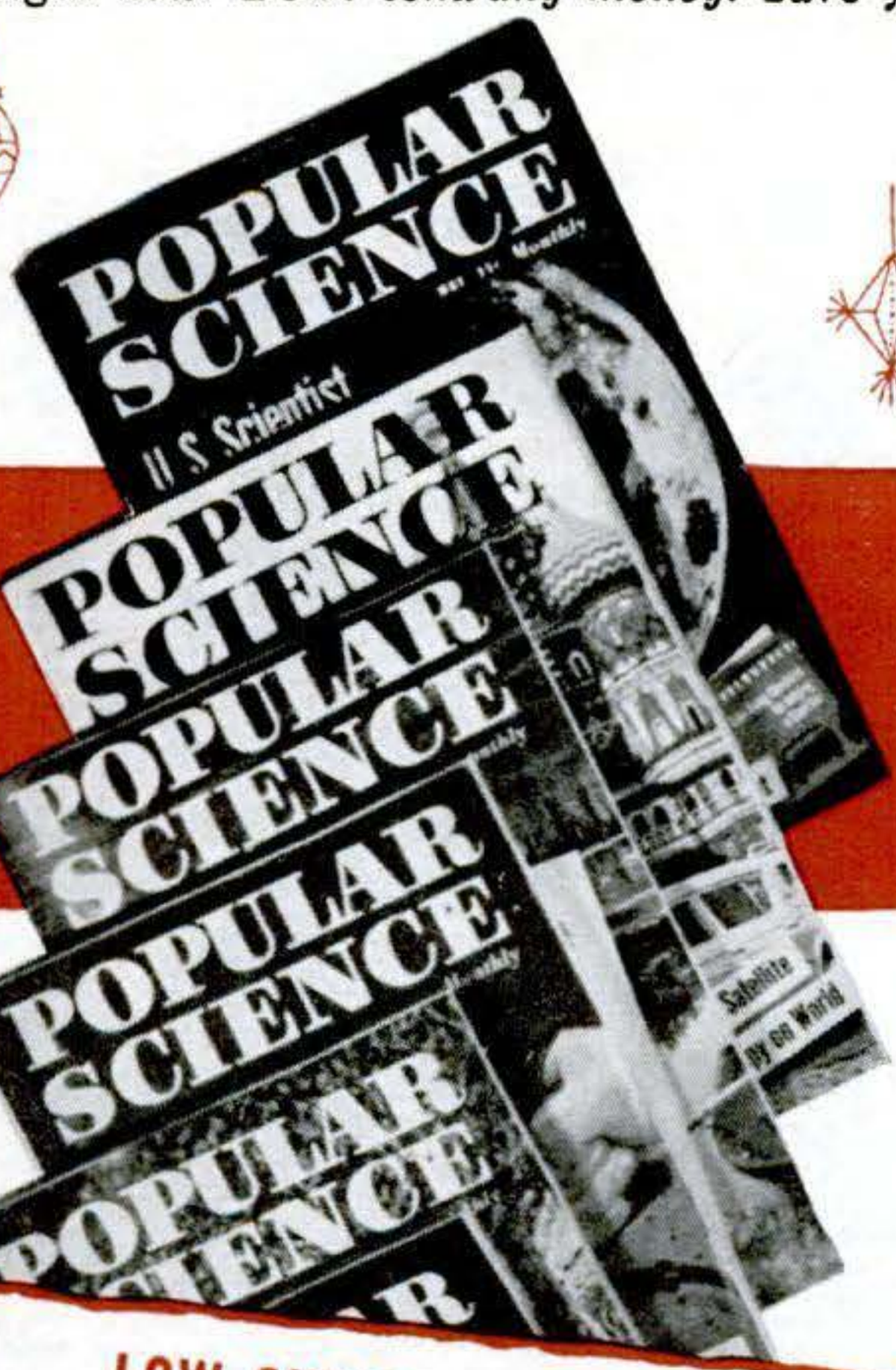

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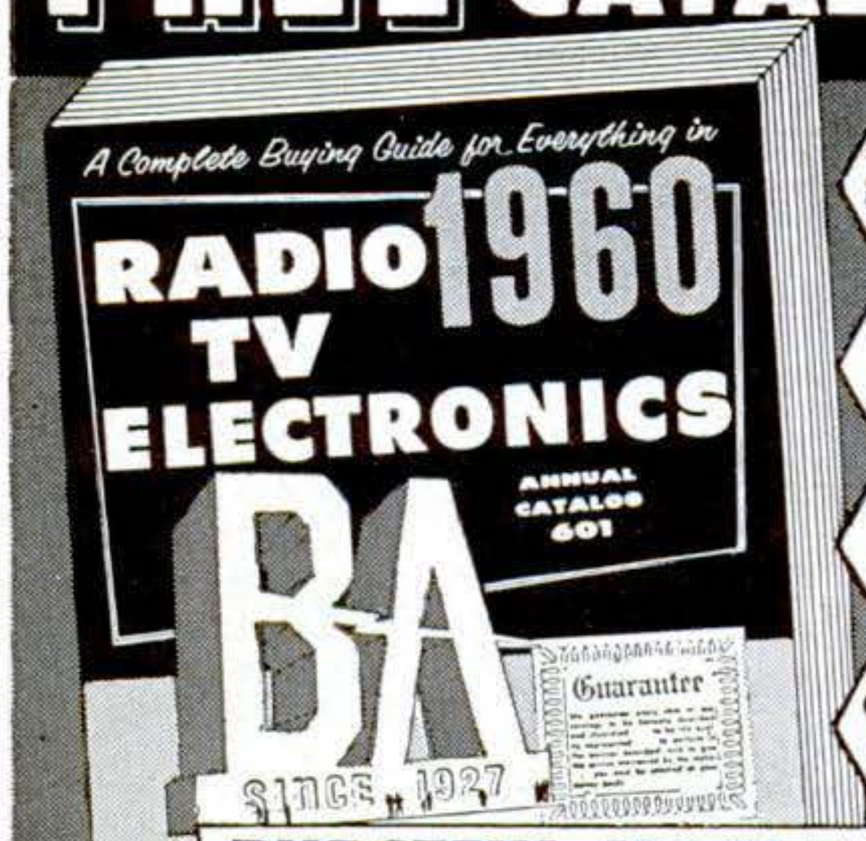

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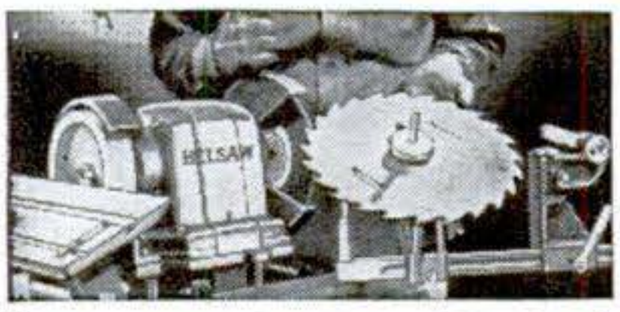

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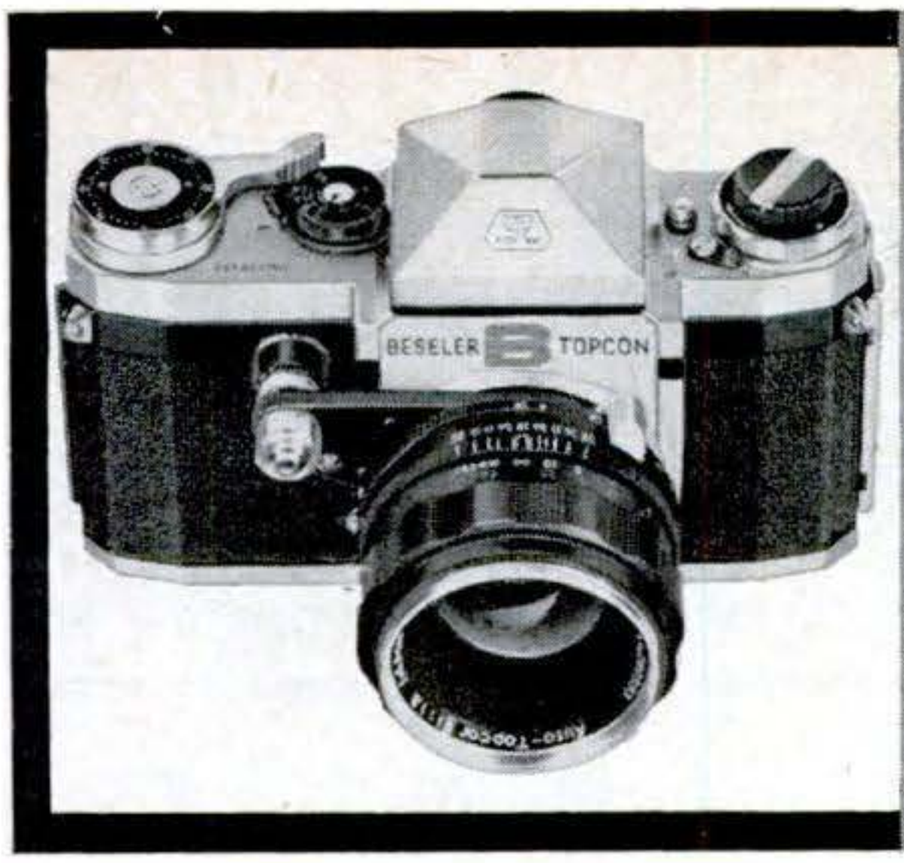

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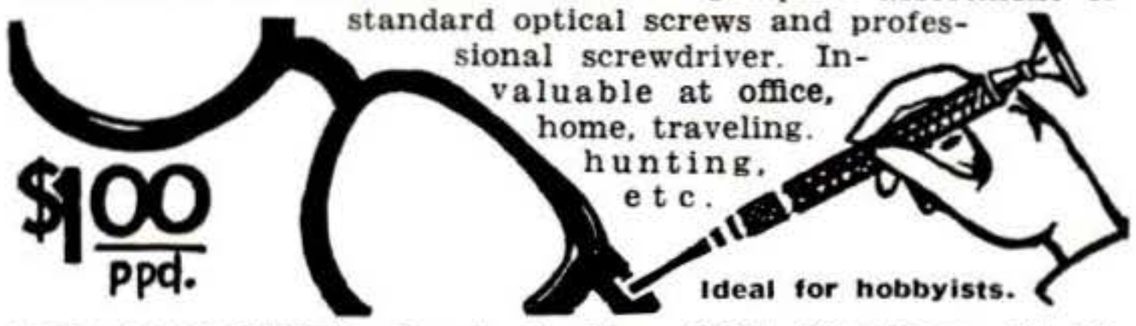

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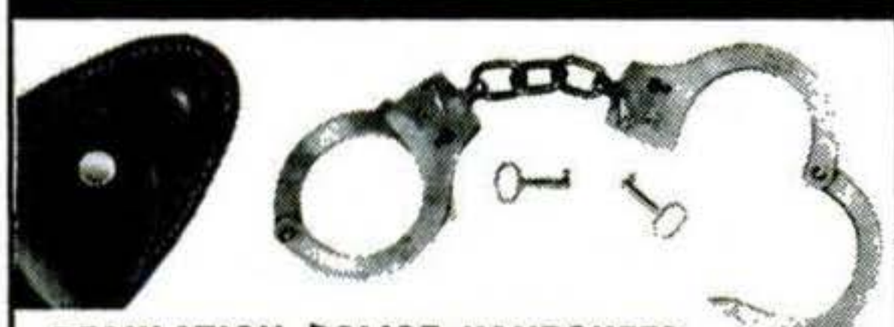

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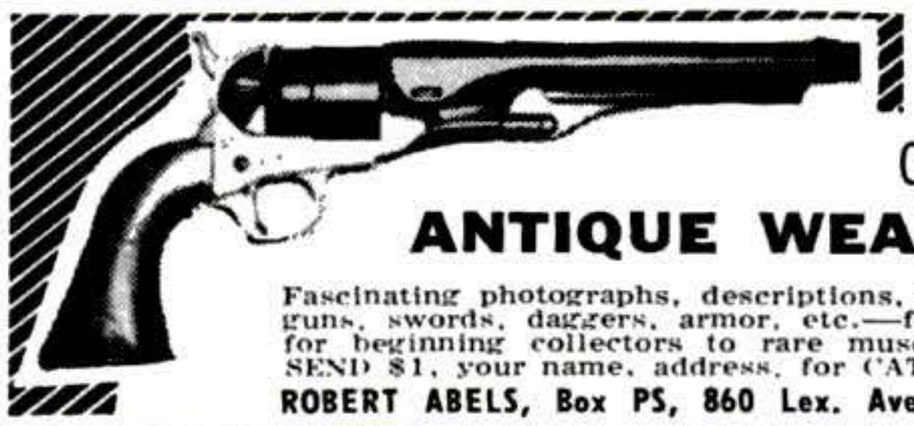

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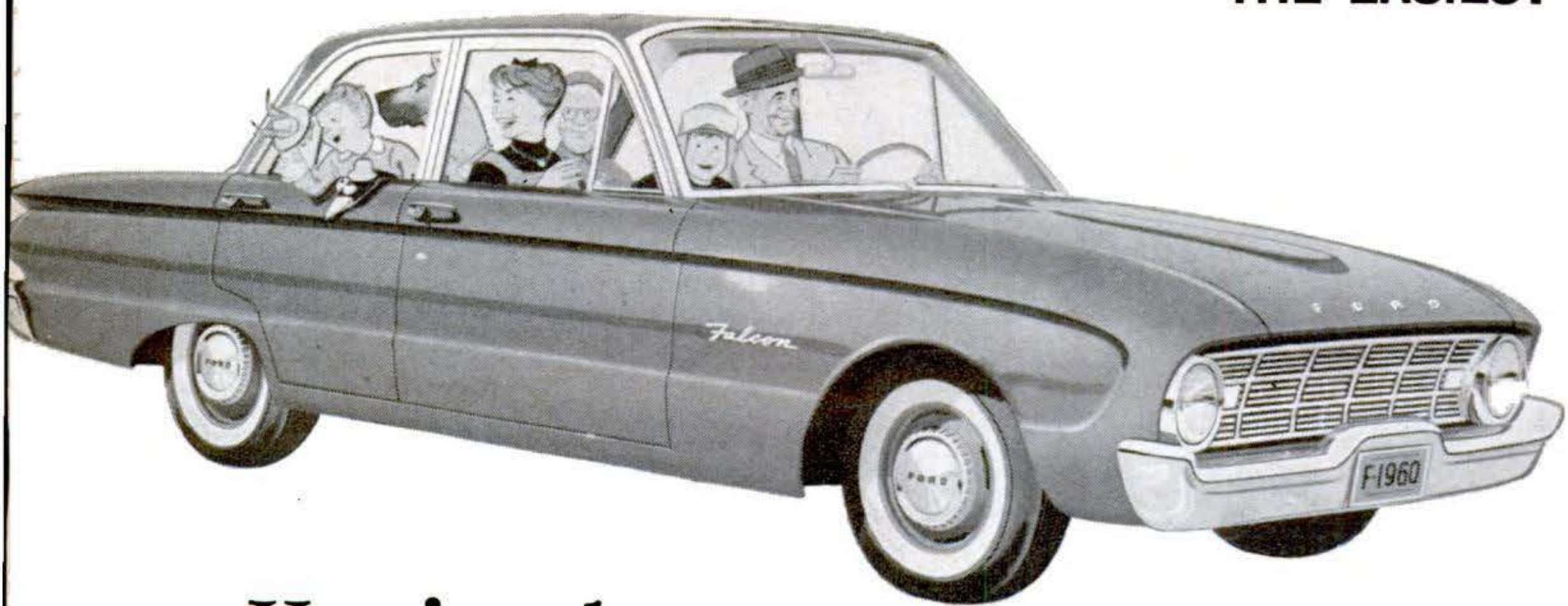


Here's why every automotive engineer is now studying the new Ford *Falcon*

Now that the new-size cars are out, expert engineers and drivers have looked them all over—tested them on turnpikes, tortured them on high speed tracks. Here's a typical test driver comment. Don Stewart, Detroit editor of MOTOR LIFE, said, ". . . the Falcon is completely capable of gliding over a wide assortment of terrain. This car is no boulevard prima donna! . . . Arriving at a sensible compromise between economy, passing power and sufficient weight mass, the new Falcon instills in its driver that sense of security rarely found in cars of its dimensions . . ."

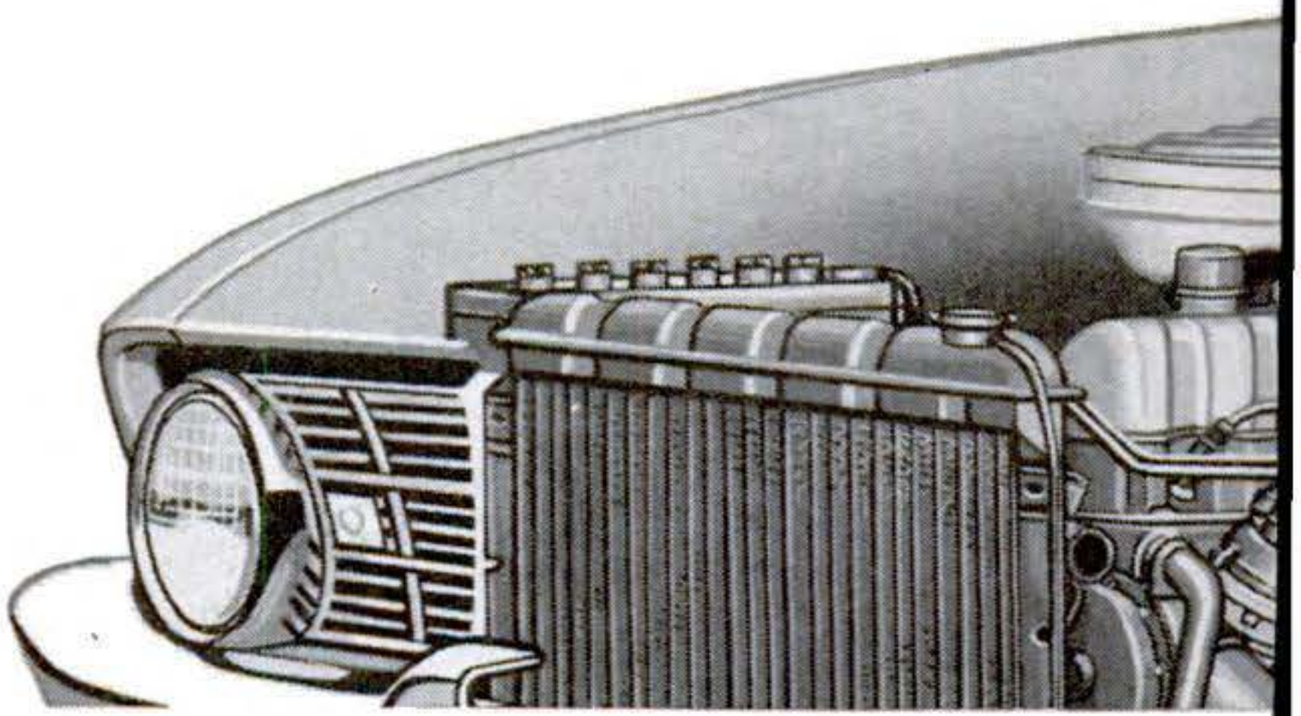
Front engine or rear? This debate is as old as the earliest automotive patents (back around the end of the 19th century), but for 1960 it's hotter than ever with two of America's leading car makers taking diametrically opposite positions. Ford's front-engine design has general advantages in safety and stability over rear-engine cars. In addition:

1. A bigger and more convenient baggage space is an obvious advantage of front-engine cars. Wheel wells and steering column dictate small, oddly shaped baggage compartments in rear-engine cars.

2. In the event of a forward collision, front engine's mass absorbs impact, provides greater safety to car's occupants.

3. Gas tank located more safely in the rear is another front-engine advantage. Some rear-engine cars have gas tanks up forward, in front of passengers.

"Do-it-yourself" simplicity. Here again Ford has taken a different route from that followed by its major competitor. The Falcon six-cylinder engine is a dependable, proven design. It



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has a single carburetor . . . eliminating the problem of synchronizing two carburetors. Vertically mounted for the greatest accessibility, it has a one-piece, cast-iron cylinder head and intake manifold for greatest simplicity. Servicing is a snap . . . no need, for example, to remove engine for valve or ring work. The Falcon Six will present no mysteries to mechanics, even the do-it-yourself variety. Other Falcon advantages: self-energizing brakes have 30 fewer parts. Fenders bolt on for inexpensive, easy replacement.

Economy and convenience without austerity. The Falcon's fresh-air, hot-water heater doesn't burn extra gas to reduce your mileage figure as do gasoline heaters. Standard gearshift lever is located conveniently on the steering column, not on the floor where it limits passenger room. Comfort features such as dual sun visors and arm rests are *standard*. Insulation, seat cushioning, and interior trim are considerably superior to the Falcon's nearest competitor.

The Test Program: Experience Run, U.S.A. After three years and three million miles of steady automotive sadism that put the Falcon to every test the wildest-eyed engineer ever dreamed of, Ford sped a fleet of 16 Falcons over every last mile of numbered Federal Highway.

The Falcon drivers, hard-nosed automotive types, sent back reports like these:

"... running 28 miles per gallon at turnpike speeds with the automatic transmission, which is very, very exceptional."

"... handles beautifully ... takes the curves just like they weren't there. We go over the mountains and hills with terrific ease... carrying about 400 pounds of baggage and equipment in the back now. You couldn't ask for any more room."

"... gotten as high as 31.1 miles per gallon and we've been doing terrific!"

"What oil? This automobile doesn't use any oil. 3000 miles so far and we haven't had to hardly look at that oil stick. This engine is sensational."

"It's got plenty of power. When we came over the Continental Divide the other day you couldn't ask for any more power ..."

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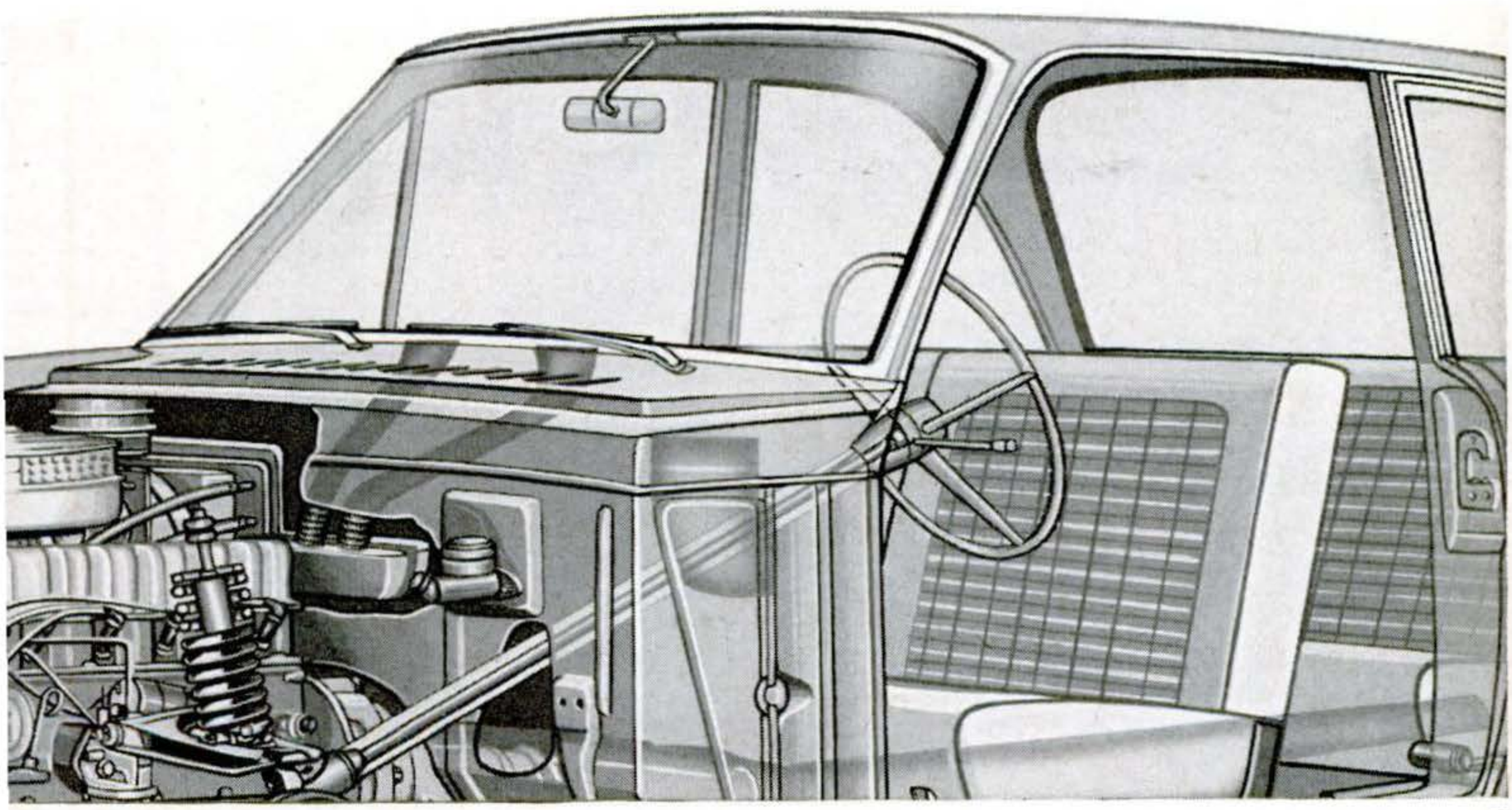

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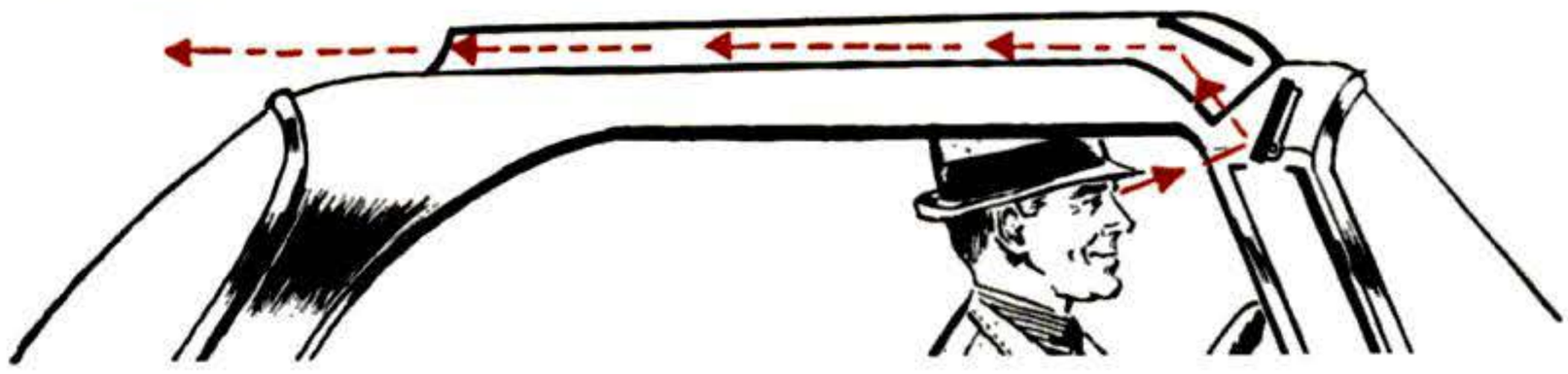
DETROIT REPORT

By Ken Fermoyle *PS Detroit Editor*

Subs Have 'Em, Why Not Cars?



Periscopes for automobiles? The American Optical Company claims significant safety advantages over conventional rear-view mirrors for a periscope-type system.

Among the advantages: a field of vision more than twice as wide; no rear posts impeding the view; no blockage of vision by rear passengers, parcels on the back shelf or rain or snow on the rear window. Not suitable as an add-on accessory, the periscope must be built into a car—so it is still quite a long way from general use.

That Corvair price tag. Chevrolet's announcement that Corvair prices start at $1,800 is misleading at the moment. This is the factory-suggested list price of a 500 Series two-door coupe. The catch: Two doors won't be offered until "sometime after the first of the year." Prices of models currently available, 500 Series and more deluxe 700 Series four-doors, are $1,860 and $1,920. When it comes out, the 700 coupe will cost $1,870. These are bare, base prices, exclusive of taxes, freight and delivery charges, accessories.

Ed Cole, boss of Chevrolet, describes the two-doors still to come as "sprightly and sporty . . . not just copies of our sedans with two less doors."

There have been hints that an even sportier, higher-performance version of the coupe might be in the offing—something of a *gran turismo* model. Corvair won't offer a wagon (though Ford's Falcon will—next spring).

Gas turbines for trucks? An experimental truck developed by Chevrolet and powered by a newly designed turbine engine is so superior to a similar truck built two years ago that Chevrolet Chief Engineer Harry F. Barr terms it "a giant stride in vehicular gas-turbine development." Called Turbo-Titan II, the truck has a power plant that is 350 pounds lighter and 25 inches shorter than the earlier version, uses 25 percent less fuel, and provides 12½ percent more power.

Quicky oil test. A simple test to determine the condition of a car's engine oil is being tried out in a few Shell gas stations.

A drop of oil is placed on a piece of neutral filter paper and allowed to spread for 60 seconds. The "oilprint" is compared with others in a manual to check the oil's characteristics. The test would prevent over-long use of oil—with possible engine damage—and unnecessary oil changing.

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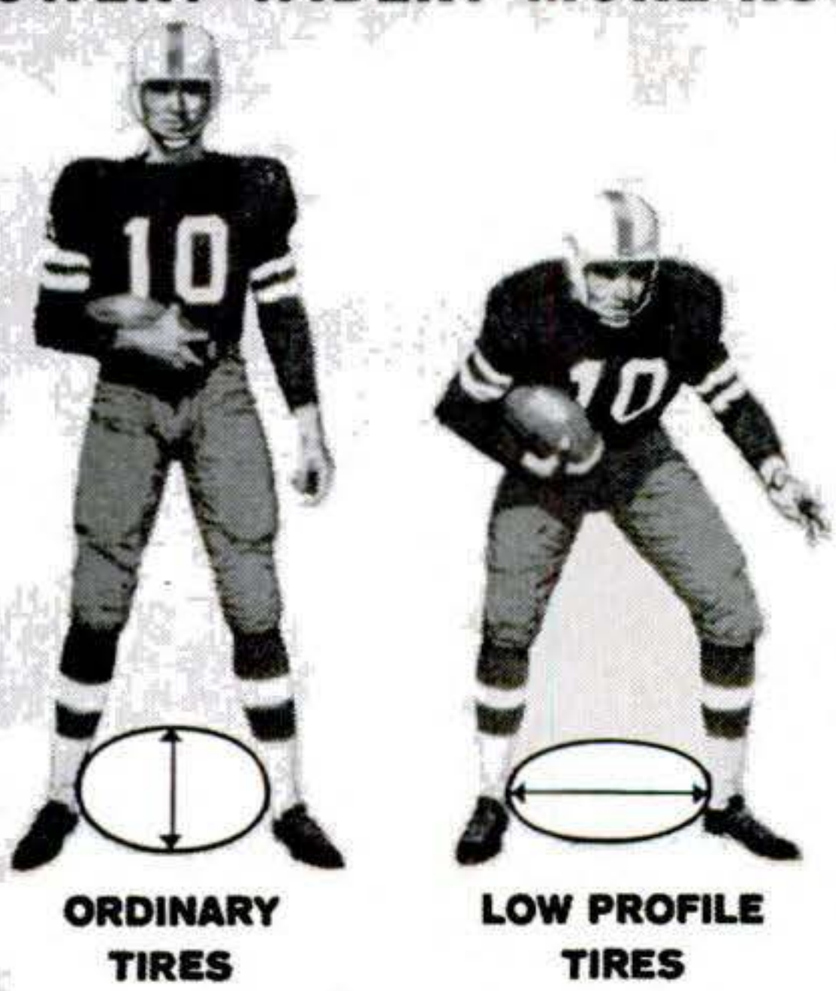
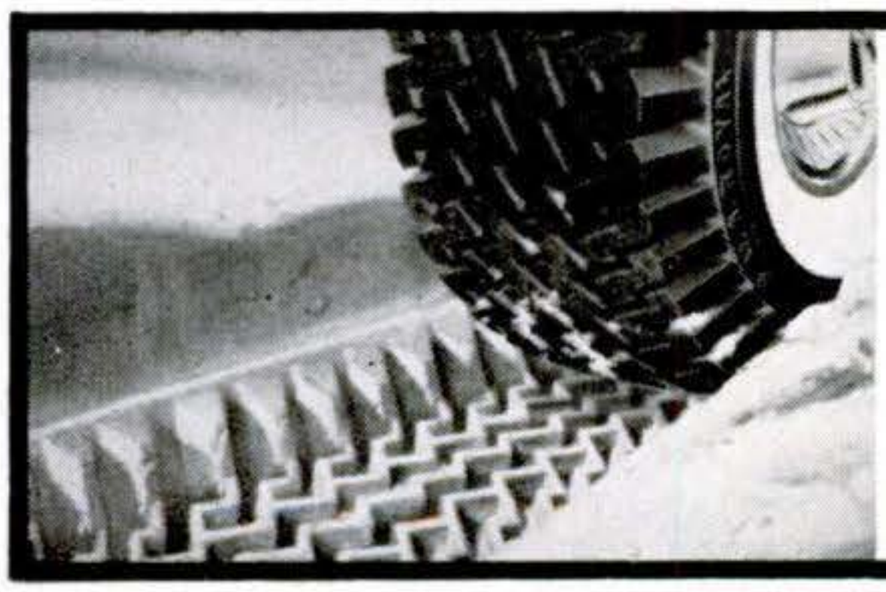
U.S. Royal's radically new tires run cooler, are safer, give up to 35% more mileage, save gas—yet cost no more!

LOWER! WIDER! MORE RUGGED! SAFER!



The fellow on the right has a lower, wider stance to give him strength and stability. In the same way, U. S. Royal's new Low Profile tires are lower, wider than conventional tires. They have the extra ruggedness and stability needed to keep you safe and give maximum wear — especially on today's fast, non-stop superhighways.

Above diagram shows how Low Profile tires are lower and wider than ordinary tires. Engineered closer to actual working shape. So they don't flex as much. Don't strain as hard. Run far cooler than ordinary tires. They're safer against tire failure at high speed. Safer on turns. Safer against skids. They wear longer. Roll easier—save gas. Originally a premium-tire feature—now at no extra price. Ask your U. S. Royal Dealer.



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THE U.S. ROYAL

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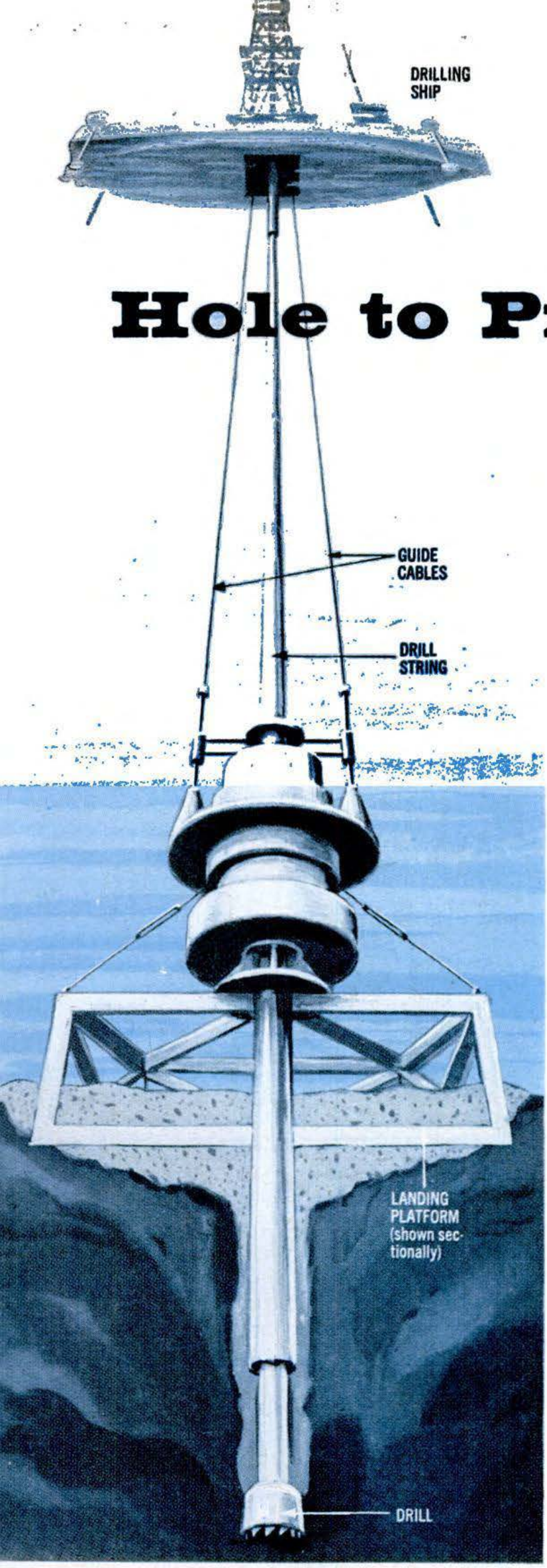


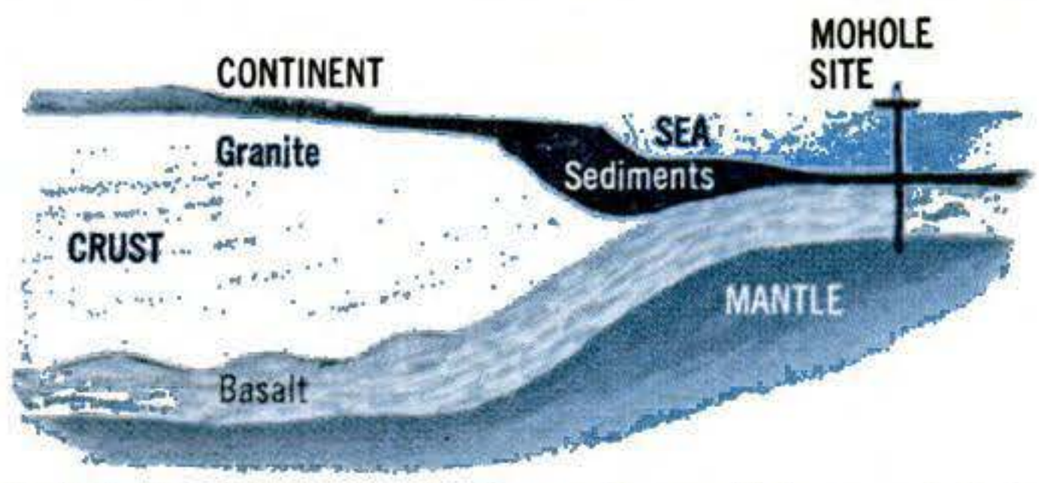
Hole to Probe Mysteries Inside the Earth

Finding out what lies six miles straight down will be one of the world's great adventures

By Alden P. Armagnac
DRAWINGS BY RAY PIOCH

WE'RE going to bore clear through the earth's crust, and find out what's inside. That's the promise of a spectacular U. S. project, sponsored by the National Academy of Sciences, to sink a hole six miles below sea level. Its aim is to reach the earth's mantle, a region of mystery that makes up four-fifths of the world's bulk, and bring up actual samples of the unknown stuff it's made of.

The record-breaking shaft, one of the greatest adventures of the world's explorers, will be bored by a drilling ship in mid-ocean. It can be completed within four



PLAN TO SINK HOLE through earth's crust into mysterious mantle calls for starting at sea bottom more than two miles below surface, as at left, and drilling some 3½ miles farther down. Crust can best be pierced beneath sea because it's thinnest there, as seen in diagram above. Upper layer of granite, present beneath the continents, is missing in sub-ocean crust.

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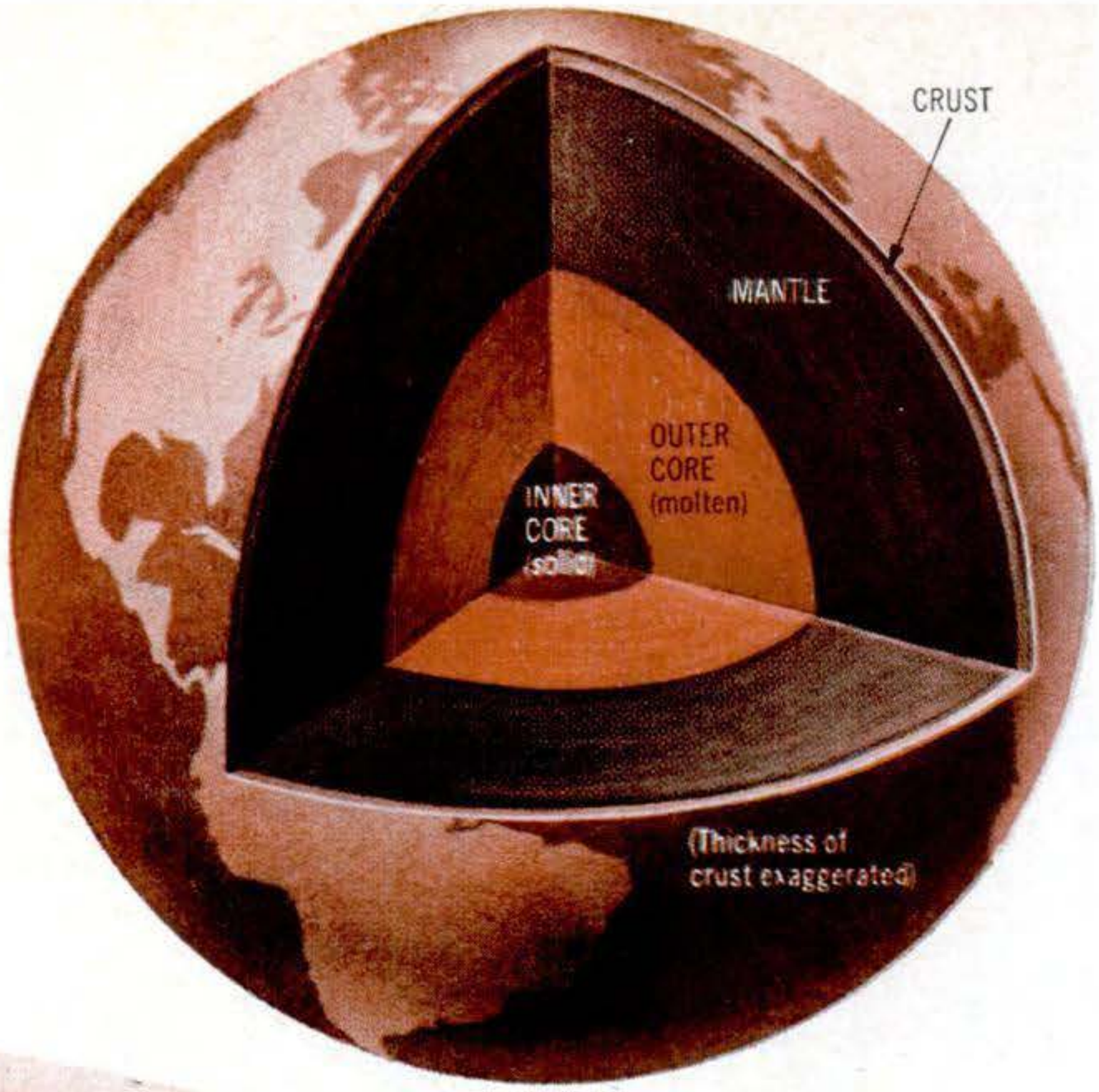
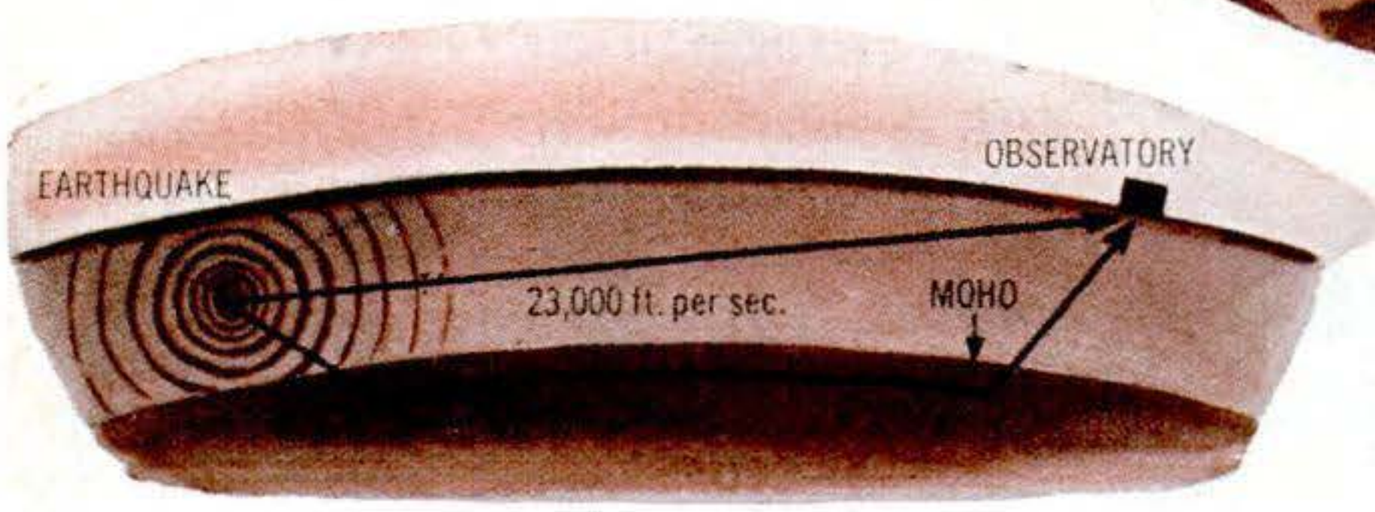
What's Inside the Earth

EXPERTS SAY our planet has a thin outer crust, then a mantle of solid rock, and finally a core, probably of iron and nickel, with outer part molten and central part solid. In relative thickness, mantle and core compare to white and yolk of a boiled egg; crust is comparatively thinner than egg's shell. Recent evidence, notably from observations of earthquake waves, supports this picture and discredits former idea that there was a worldwide sea of molten lava immediately below the thin crust.





ABRUPT CHANGE in nature of rock is shown by speed-up of quake waves some 20 miles below land, less below sea floor. This level, called the "Moho," is considered the dividing line where the earth's crust ends and mantle begins.

years, and will richly repay its $15,000,000 cost in benefits to science and industry. Already under way, with the help of Government funds, is the first practical step —a survey to pick the site.

So reports an NAS committee headed by Gordon G. Lill, chief of the Geophysics Branch of the Office of Naval Research. His group has been studying the bold project, has found it feasible, and has now been directed by the NAS to carry it out.

Origin of name. The planners call their shaft the Mohole, because its goal lies just below the crust-mantle boundary, known to earth scientists as the Moho. Both are named after the Yugoslav discoverer of the boundary, Prof. Andrija Mohorovicic.

The Mohole will begin at the ocean floor, beneath more than two miles of sea water. In turn it will penetrate a layer of sediment and a thicker one of basalt rock. Then, having pierced the crust of the earth, it will poke at least 100 to 200 feet into the rock of the mysterious mantle—a prospect more exciting to the explorers than a look at the hindside of the moon.

When an oil-seeking Texas well recently reached a depth of 25,340 feet, nearly five miles, it was the deepest that the subterranean world has ever been penetrated. By going just a mile farther down, at the right place, the Mohole will add far more to our knowledge of the earth's interior.

There's a good reason for starting the Mohole beneath the ocean. Under land, the earth's crust averages 20 miles thick; under the sea, only five miles. And seismic studies, which provide these measurements of thickness, lately have found thin spots that a 3½-mile boring can pierce.

Choosing the site. Now U. S. research vessels are examining the thin spots as prospective sites for the Mohole. Surveyed so far are an Atlantic area north of Puerto Rico; and a Pacific region, which looks more promising, off the Mexican coast between Guadalupe and Clipperton

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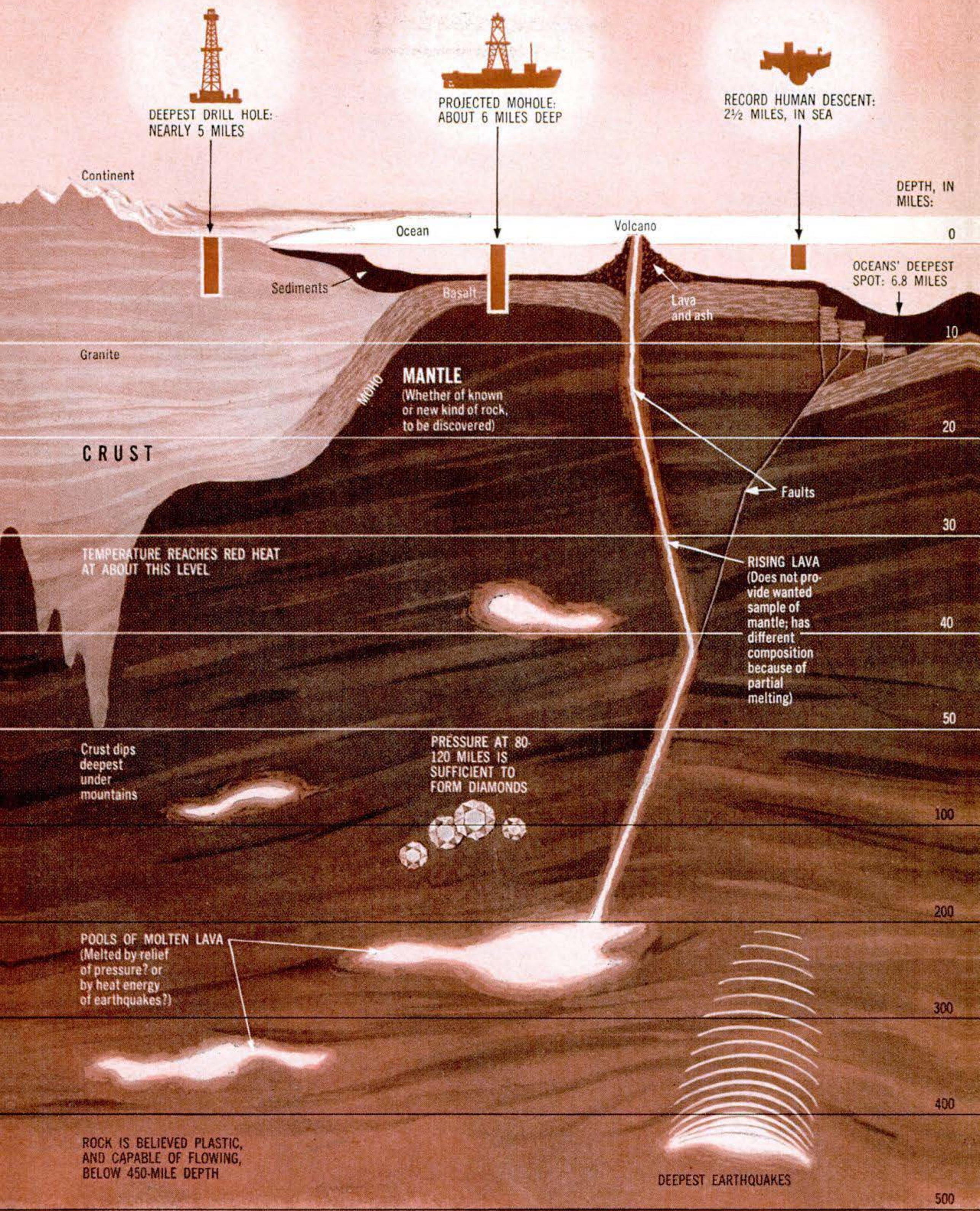
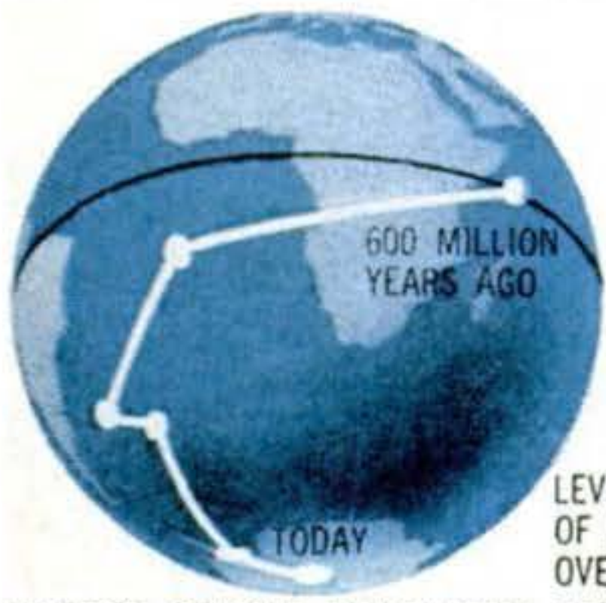
The world's greatest unexplored region lies only a few miles beneath our feet



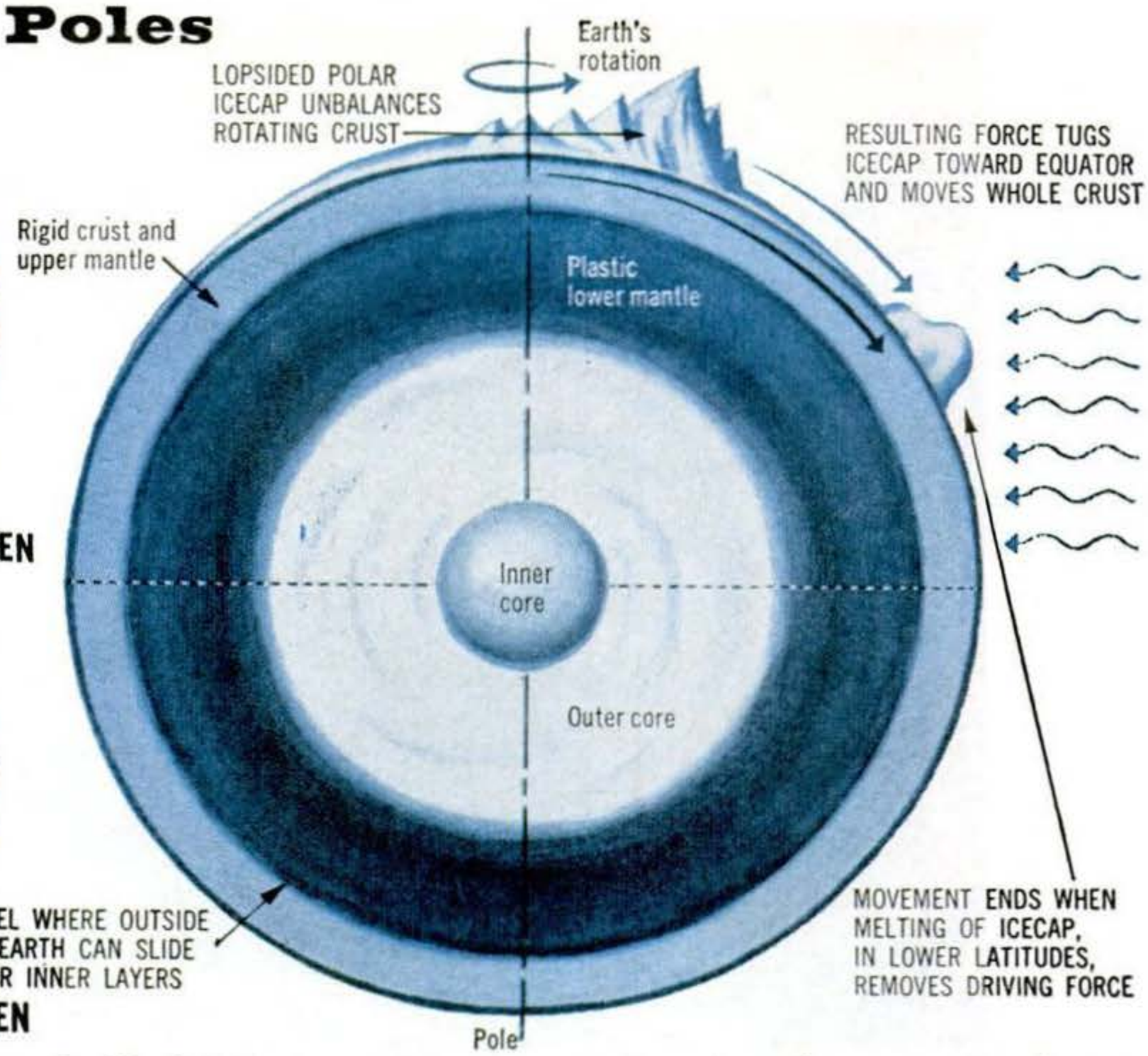
(Vertical scale exaggerated, especially within 50 miles of surface)

Earth's Skidding Crust Has Moved the Poles

WHERE NORTH POLE HAS BEEN



WHERE SOUTH POLE HAS BEEN



WHOLE SKIN of earth has periodically slid about, it's believed, over plastic layer in mantle. Studies of rocks' magnetism indicate that poles have shifted far, with South Pole once in equatorial Africa. By one ingenious theory, motive force came from lopsided polar icecap, which the earth's spinning pulled toward the equator until the warmer latitude melted the ice.

Islands. The final choice may be made by early next year.

Drillers will begin actual operations by sinking several practice holes, in shallower water and to lesser depth than the Mohole. For this they'll adapt available offshore-drilling equipment. Then will come the construction of a built-to-order drilling ship, and the reach to the mantle.

The scene of the great adventure will be the largest drilling ship ever built, topped by a towering derrick rig. It may dispense with anchors, maneuvering constantly with large outboard-type motors to remain centered within a 1,000-foot-diameter ring of marker buoys at the chosen site. Currently this looks to the planners like the best way to hold the vessel, despite wind and current, within a permissible 240-foot radius above the hole being drilled.

Ideas from offshore oil. By remote control the drilling crew will set up an advance base of operations on the ocean floor. Lowered into a shallow borehole there, a six-sided "landing platform" will be securely cemented in place. Then a drill string extending down from the surface, and passing through casing at the platform's center for guidance, will proceed with the boring.

In this system, already used successfully to drill oil wells, the drill string can be remotely uncoupled and recoupled at sea bottom. Vertical guide cables between surface and landing platform make this possible. So the Mohole drilling ship can suspend work to flee or ride out a storm, leaving the lower half of the drill string sticking out of the hole, and the guide cables marked with buoys. On returning, it can quickly make connections again and resume drilling. If a drill string snaps, the system will easily relocate the hole, saving the project.

Turning the miles-long drill string from the surface to bore the Mohole might cause excessive whip and vibration. So power may be applied at the lower end to a turbodrill, which is rotated by the flow of drilling fluid down the pipe; or

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to a sound drill, whose bit is vibrated at high frequency by the fluid.

High temperature—expected to reach almost 400 degrees F. at the Mohole's bottom, compared with 350 degrees in the five-mile Texas well—will raise no serious drilling problem. Boreholes have been successfully drilled in abnormal heat up to 460 degrees, the temperature in another Texas shaft, which is called the world's hottest well.

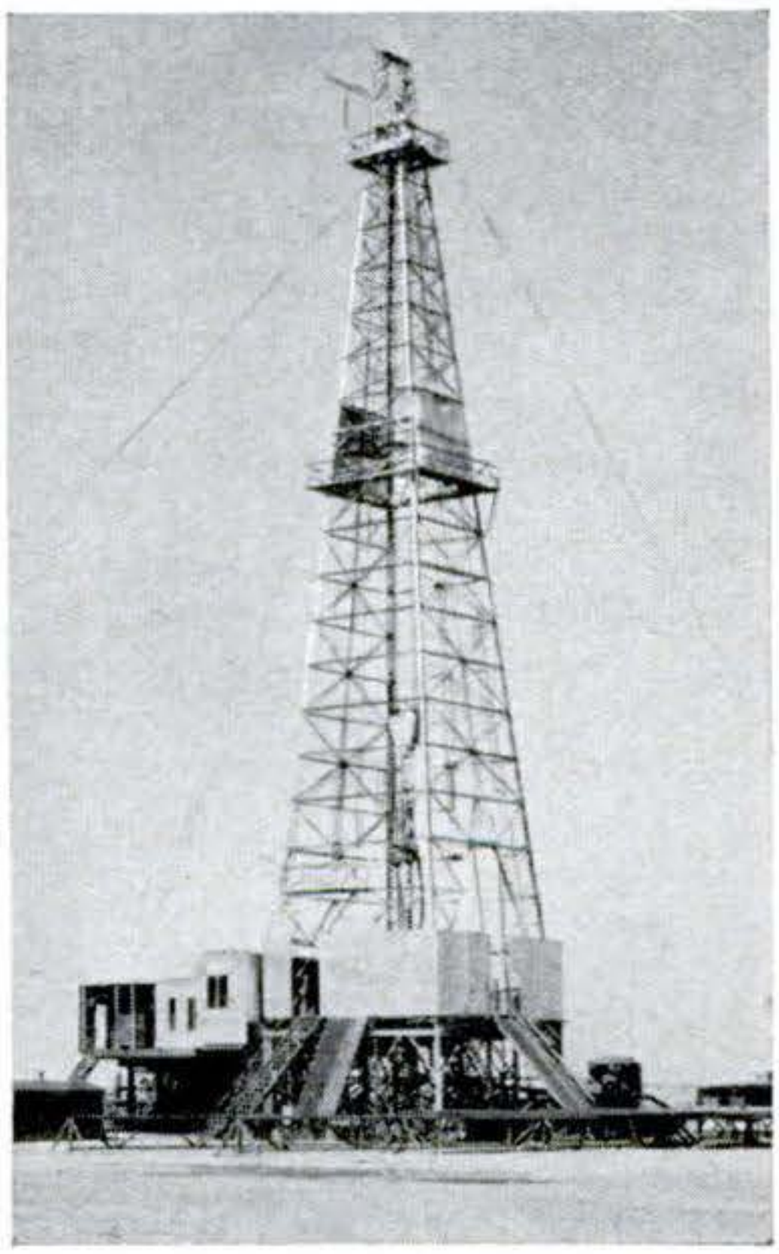
As the Mohole descends, "cores" or cylindrical rock samples will be brought to the surface. Probably they'll be taken continuously in the sediment layer, at intervals in the basalt layer, and continuously again in the mantle. Planners expect to use a method called wire coring: A wire lowers a sampling tool down the drill pipe and hauls it back with the sample, without interrupting the drilling. Earlier practice operations will test and perfect the Mohole's sampling technique.

From its very start, practice holes included, the expedition to the mantle will be making thrilling revelations.

Marine fossils in the sea-bottom sediment may trace back the evolution of life to its very beginning on earth. So far, tools lowered from research ships have been able to sample only the top 100 feet or so. By going all the way through, the Mohole drilling will bare the whole exciting story.

Somewhere below the sediment the drillers may find the original surface of the earth—completely hidden, today, beneath lava-built continents or ocean water and ooze. It may be pitted with meteoritic craters, and resemble the face of the moon.

What will they find? The climax will come when the Mohole breaches the bottom of the crust, and specimens from below start coming up. Then the explorers will gaze upon chunks of a heavy rock, possibly black in color—the first samples of the earth's mantle ever seen.



DEEPEST HOLE so far, this well in Pecos County, Tex., recently set drilling record of 25,340 feet, or nearly five miles down.

Will it be some known sort of rock? Or will it be something more exotic, a weird new kind, created by a pressure 2,000 times as great as in our surface world? Whatever comes up from the mantle is sure to get the most searching variety of tests a rock ever had.

Using the Mohole. Tapering perhaps from eight-inch diameter at its mouth to four-inch diameter at its bottom, the Mohole will permit lowering instruments all the way down. From the subterranean outpost, electric wires will bring back direct observations of temperature, magnetism, gravity, and every other clue the Mohole can contribute to new knowledge of the earth's interior.

The Mohole may well yield practical rewards: new information about the origin and extent of petroleum deposits; faster, cheaper, and better techniques for deep oil-well drilling. Powerful undersea pumps and load-handling equipment developed for Mohole use may later aid in mining the sea for valuable minerals.

Such commercially interesting prospects make it unlikely that the Government will have to foot the whole bill for the Mohole project. NAS planners think oil companies, and others, will make substantial contributions in money and materials. Offers already received include one from General Electric to lend a million dollars' worth of diesel-electric generating equipment.

By now the planners feel reasonably confident that remaining problems of engineering and financing will offer no snags. To their head man, Gordon Lill, the chances that they'll actually start drilling the big one look better than five to one.

New theories. The Mohole will cap recent advances in earth science, which have already turned earlier ideas of the world's construction topsy-turvy.

[Continued on page 250]

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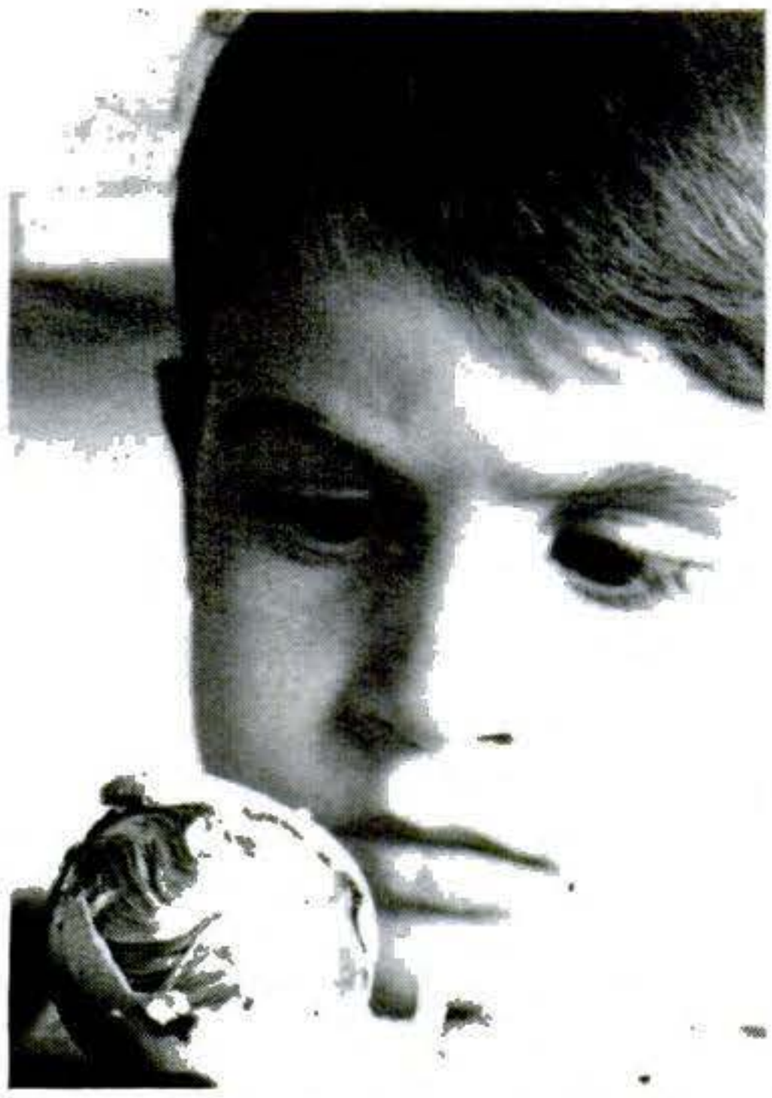
1. What's that noise?



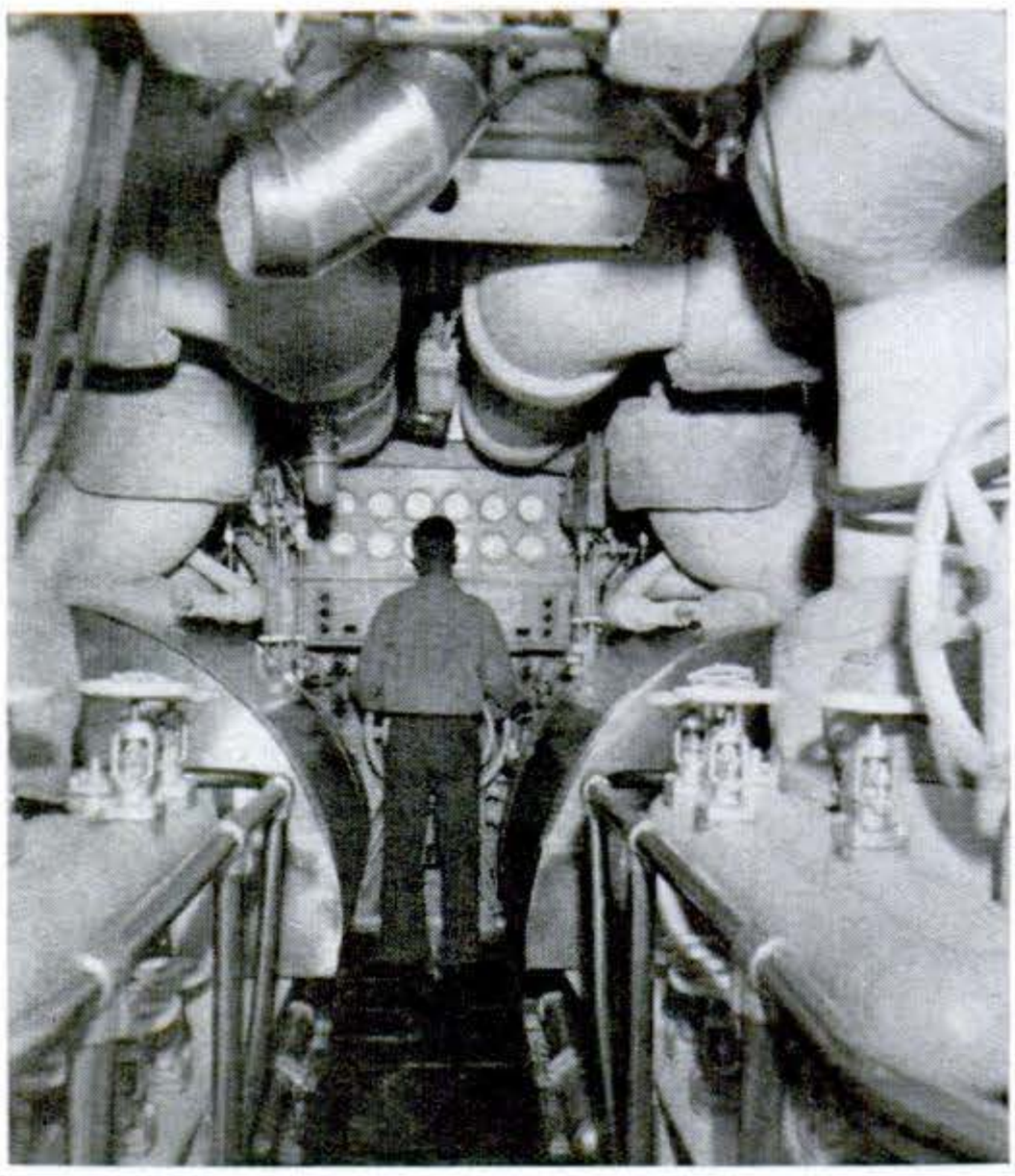
2. Hey, what's going on here?

3. This thing takes time.

TINY DRAMA—BIRTH OF A CHICK

A THREE-YEAR-OLD watches the mysteries of life unfold. The sequence was photographed at the International Animal Nursery at Coney Island, Brooklyn, N. Y. There city-bred children can cuddle and feed a wide variety of animals. They can also watch—at a special exhibit—the emergence of chicks from hatching eggs.

SHOOTING CAR. This police car sports a gun barrel on its hood. The gun is triggered electrically from a pistol grip on the dash. It was shown at a demonstration for Rangers and other law officers in Texas. It fires .357-magnum bullets.



SPEEDIEST SUB. A U. S. Navy photo shows the engine room of the A-powered Skipjack, fastest sub known. Steam turbines beside the engineman drive the screw. Overhead pipes supply steam from nuclear-heated boiler tubes.

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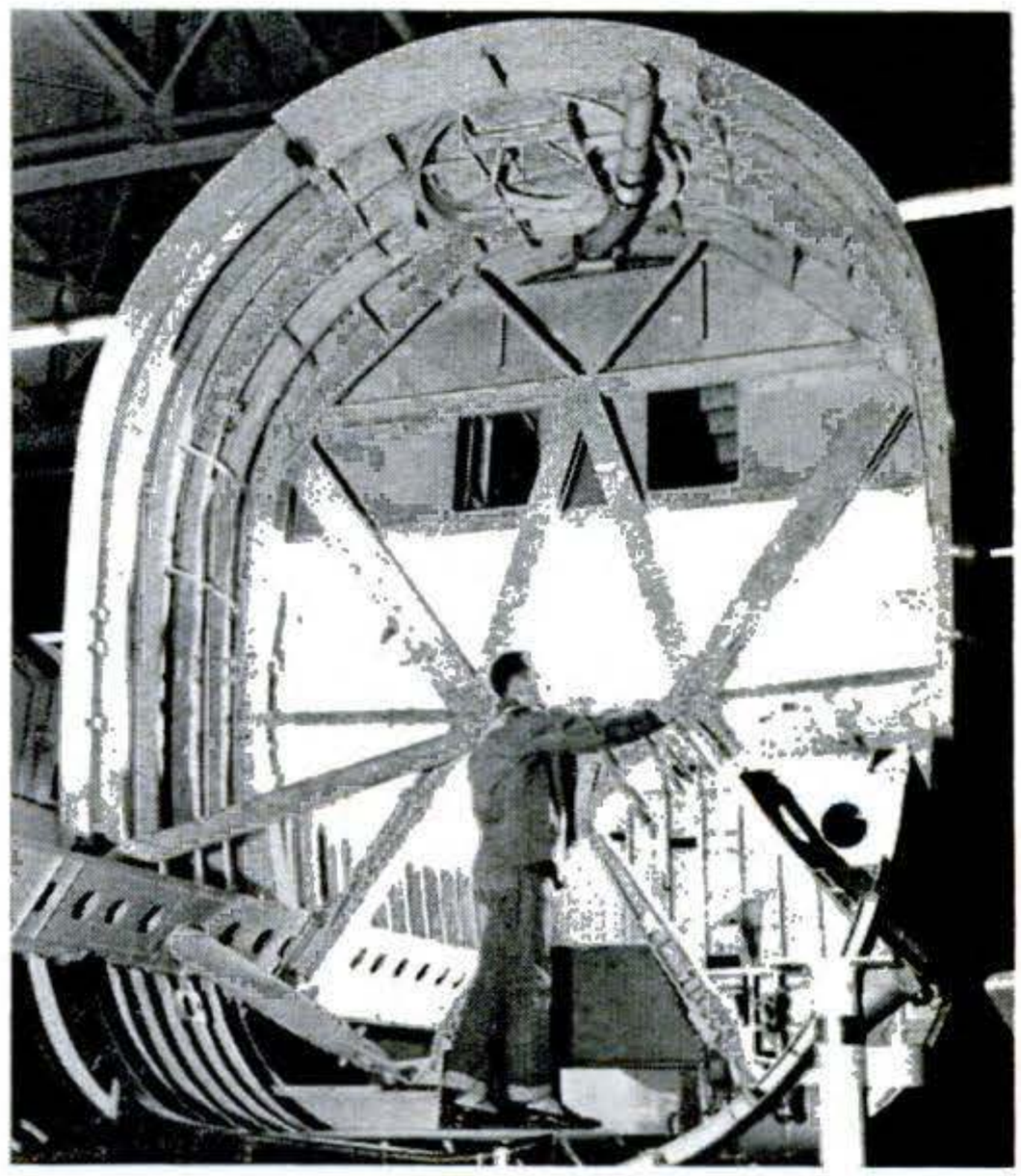
4. Oh, it's a baby chick coming out of the shell.

5. It's pretty, too.

6. And so soft and fuzzy.

THREE LITTLE PIGS. These pigs will go to college instead of to market. Specially bred for small size at the University of Nebraska, they weighed 9½ pounds at birth, 40 after 140 days. They'll be used for research.



BIG BOMB BAY. No plane fuselage is this, but the bomb bay of an eight-jet Boeing B-52. It measures 12 by 14 feet, can launch America's Sunday punch —a guided missile to strike hundreds of miles beyond the bomber's range.

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T-Men's New Tricks Trap Bootleggers

Using cars, planes, radios, and gadgets they won't even talk about, revenooers are winning the war against illegal booze

IT'S getting so a man can't hardly make a dishonest gallon of whisky any more. The revenooers are clearly out front and winning in their ancient contest with the bootleggers. Their edge comes partly from shrewd use of modern tools of science, partly from tighter laws, mainly from old-fashioned police legwork.

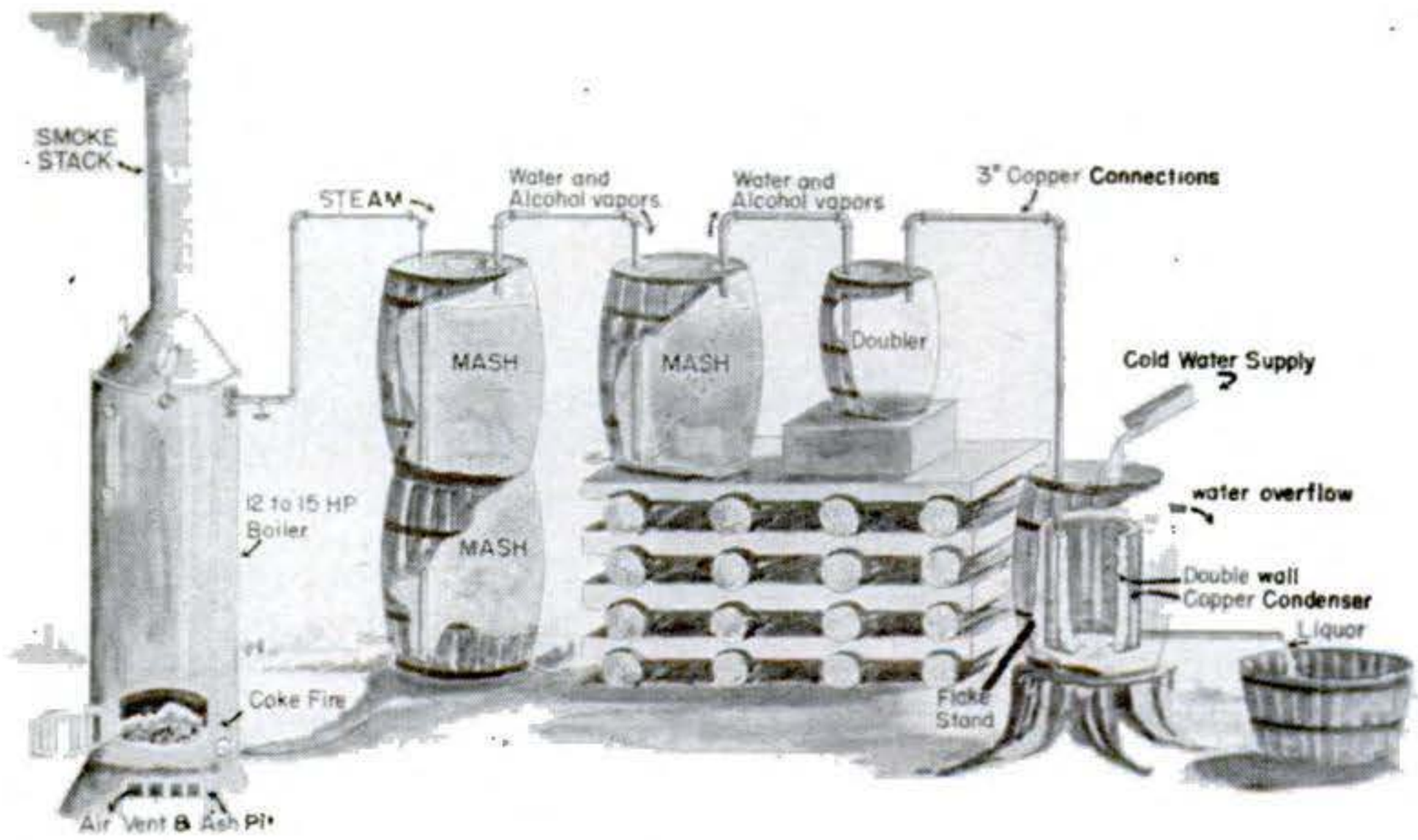
The box score of illegal stills knocked out shows how far ahead the Feds are getting: In 1956 (a peak year), more than 14,000 stills were seized; the number dropped to 12,000 in 1957 and close to 9,000 last year. This record means money in the bank to John Q. Taxpayer. Every gallon of illegal liquor cheats the U. S. government out of $10.50 in taxes—a loss you have to make up.

The cops with the long, long titles—enforcement agents of the Alcohol and Tobacco Tax Division, Internal Revenue Service—and motley nicknames—revenooers, Feds, T-men, agents, branch walkers, bird doggers, bomber boys—work every trick in the book and some that aren't in it. To get the mash and the men who deal in it, they use airplanes, souped-up cars, handie-talkie radios, telescopes, telephoto cameras, fingerprint and handwriting analysis, plus a number of gimmicks they won't tell anybody about.

The Case of the Moonshiner's Nails is a good example. It started when agents moved in fast on a still hidden in a Virginia ravine. The moonshiners slipped out through the brush faster yet. The still wasn't even finished; carpenters' tools and nails lay hastily discarded.

Down the road a piece the reserve line of revenooers waved over a fast-running car. "Just ridin' to Aunt Tillie's to do some fixin' up," the driver said. He had a few tools in the back, sure enough—and a keg of nails.

Now the scene shifts to the Washington Laboratory of the Internal Revenue Service. Routine checking of legal alcohol was put aside for examination of some nails under a microscope. The machines that make nails leave marks on their product, marks that are as individual for each machine as the marks on a bullet are for the gun that fires it. The



MAKING MOONSHINE: Mountaineer's old-fashioned pot-still is shown at left, in one of series of diagrams of illegal stills that decorate office of chief T-man John Lathem. Such crude plants are common in the South where bootlegging is often a way of life. Steam distills off a fiery but drinkable whisky from fermented mash, made by cooking corn or any other grain.

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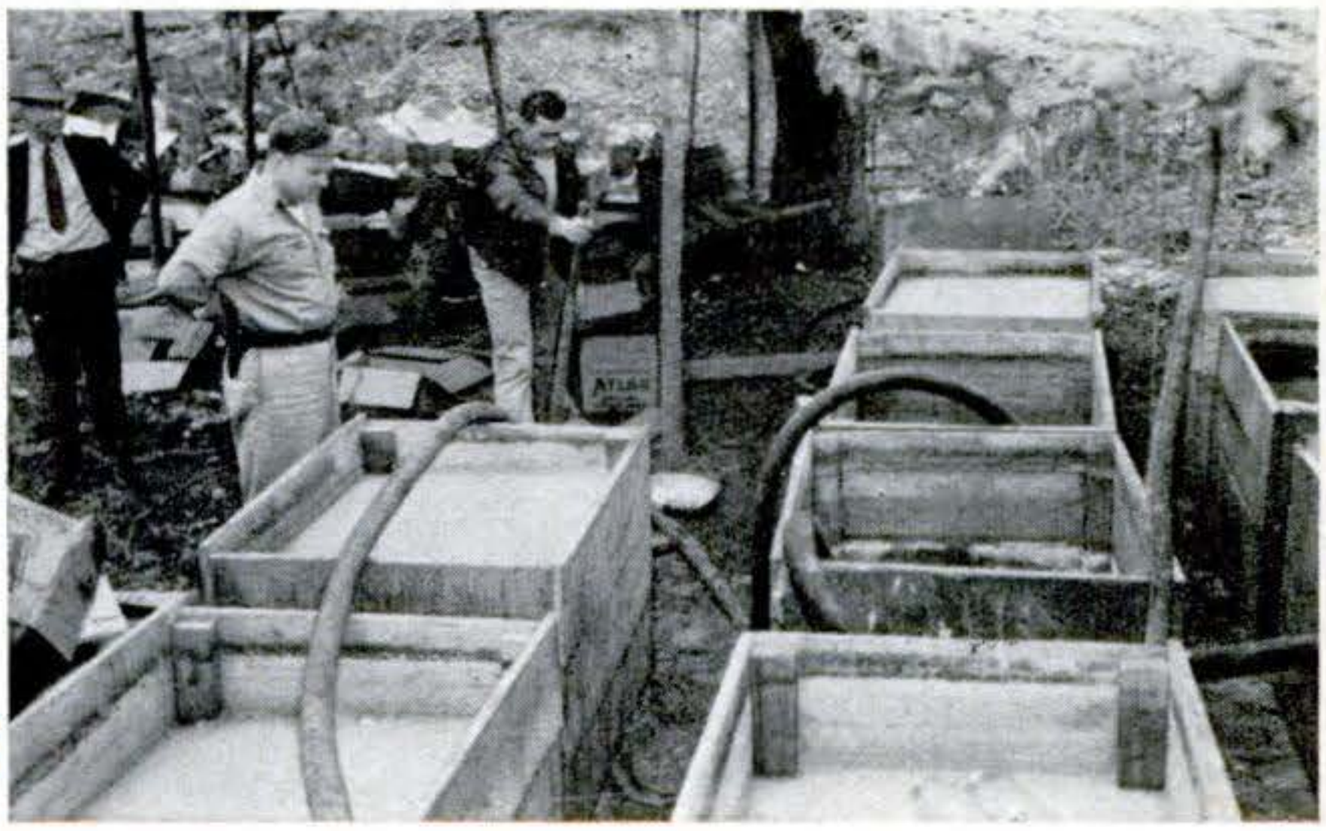
HANDIE TALKIE synchronizes attack to catch moonshiners at work. T-men seldom have to use their guns.

STEEL BOILER supplied steam for 750-gallon moonshine still in woods of St. Mary's County, Md.



OPEN BOXES held fermenting mash. Product was bottled in fruit jars (note two floating in box at right).

microscope showed them plainly. There was no question: The nails from the keg in the car were identical to the nails found near the still.

Where there's smoke, there's firewater. Nail identification is unusual, but airplane spotting is standard operating procedure in the mountains of the South (90 percent of the country's illegal stills are concentrated there, with the rest centered around cities such as New York, Philadelphia, and Detroit). A curlicue of smoke over the woods calls for investigation. It could be only a cook fire in a lonely cabin—or it could give away the boiler of a still. A lightplane makes it easy to see the smoke and check for boilers and vats that can be snugged behind hills many miles off a passable road.

The moonshiners are wise to this gambit now, of course. The smart ones camouflage their plants like an Army gun emplacement, covering the setup with nets supporting leafy branches.

Farther west, where the country is open, concealment grows more elaborate. One still was found entirely underground, in the secret basement of a new barn, a buried pipeline supplying its steam from the farmhouse.

Long-distance snooping. The revenooers adapt to the terrain, too. Lacking brush to hide in, close-up surveillance is out—snoopers would scare off the quarry. That's where telescopes come in. Posted on a knoll a safe mile away, a man with a

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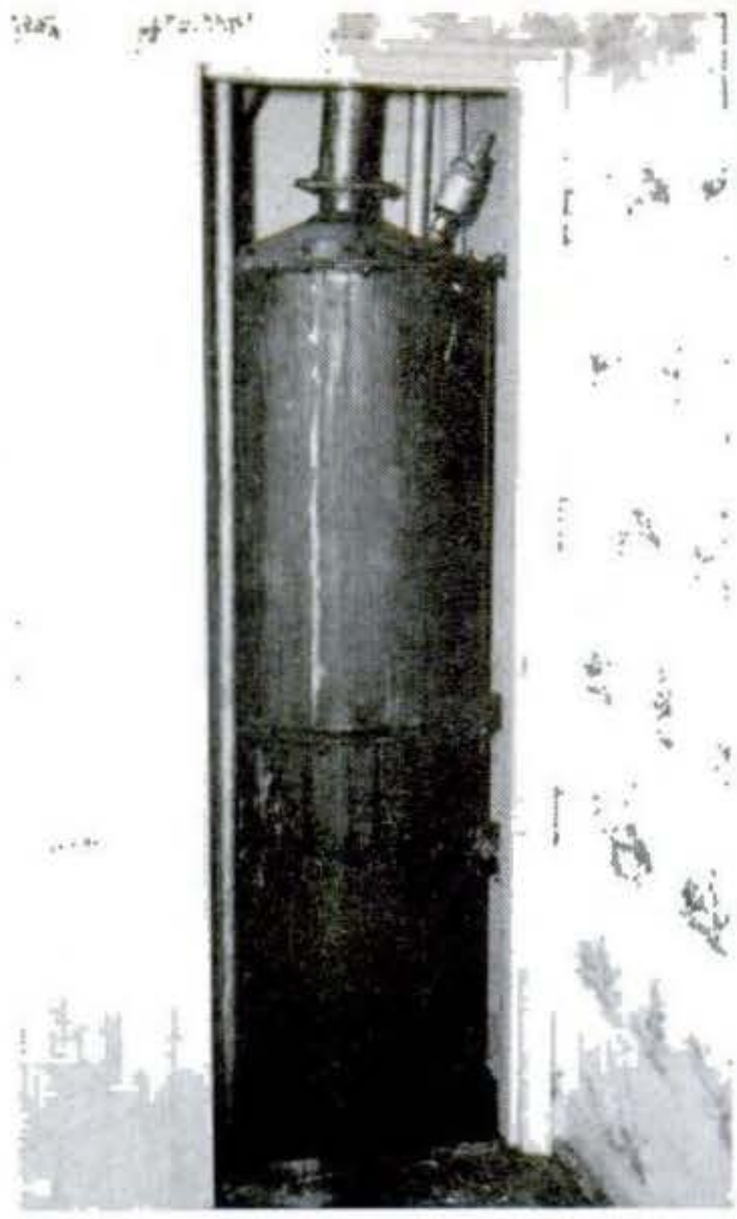
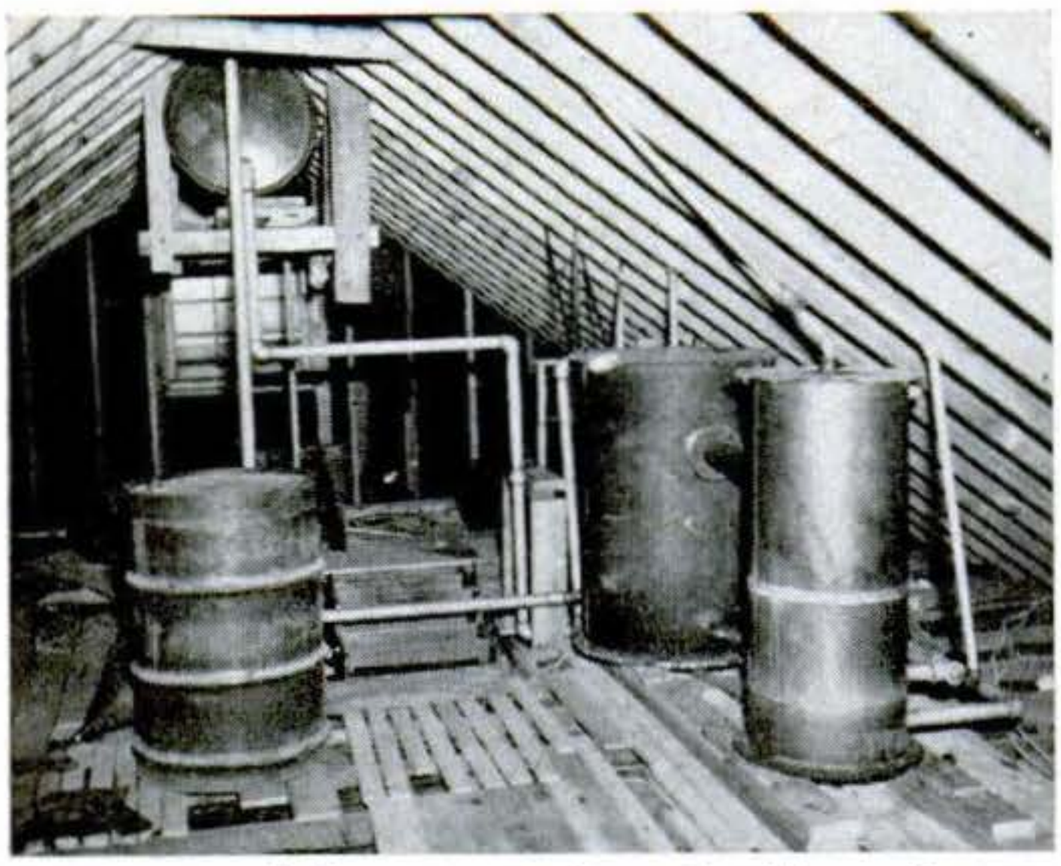
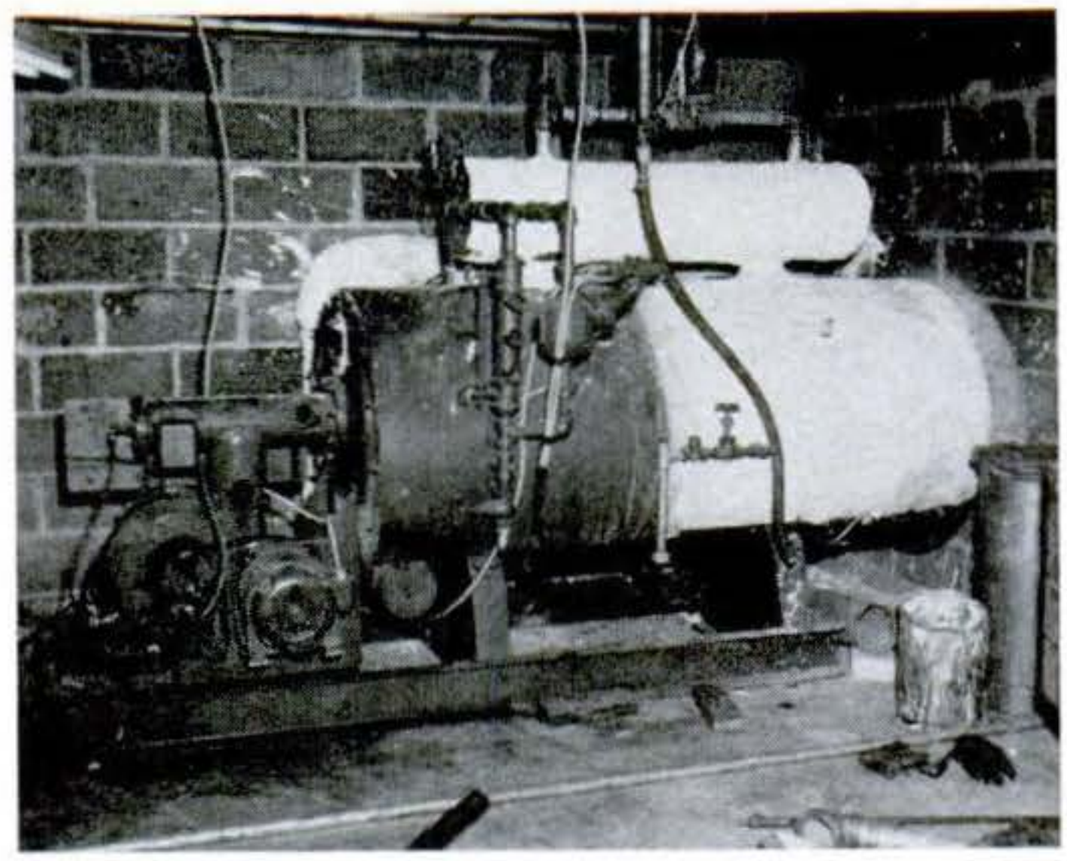
Northern bootleggers make pure alcohol in complex equipment, elaborately hidden

CELLAR-TO-ATTIC STILL, its parts tucked into every imaginable nook and cranny of house in a New Jersey suburb, was raided before it could be used illegally. Revenue agents (who took these pictures) found copper column (right) inside bedroom closet.





ATTIC revealed water tank and still condenser. Pure-alcohol product of such stills is undrinkable and must be diluted by the purchaser.



CELLAR, reached via trap door in floor, contained oil-fired boiler. Plant, like most in North, was soundly engineered and expertly built.

good scope can pick up lots of interesting and incriminating information—most particularly, license-plate numbers of regular callers at the hidden still.

Yet the neatest trick with a telescope was pulled right in the close confines of a city. The Feds were hot after a well-heeled gang that covered its tracks all too well. These were no tinhorns operating from the back room of a saloon; headquarters was a respectable office on the eighth floor of a midtown business building. That gave the agents an idea.

They rented an office on the eighth floor of the building directly across the street and set up a telescope at the window. Then they got a lip reader into the act. Seated at the scope, he took down the gang's secret conferences, word for word.

Hot cars are a vital weapon in the T-men's arsenal. Not for the reason you'd guess if you've been watching those old prohibition-era movies on TV—there are no more racing fights with Tommy guns blazing from the tonneau of the mobsters' big black Packard. The cops need those fast cars to catch booze-hauling deliverymen.

Day of specialization. The bootleg racket, like any big business, is subdivided into more-or-less independent specialties: distillers, wholesalers, distributors, re-

[*Continued on page 230*]

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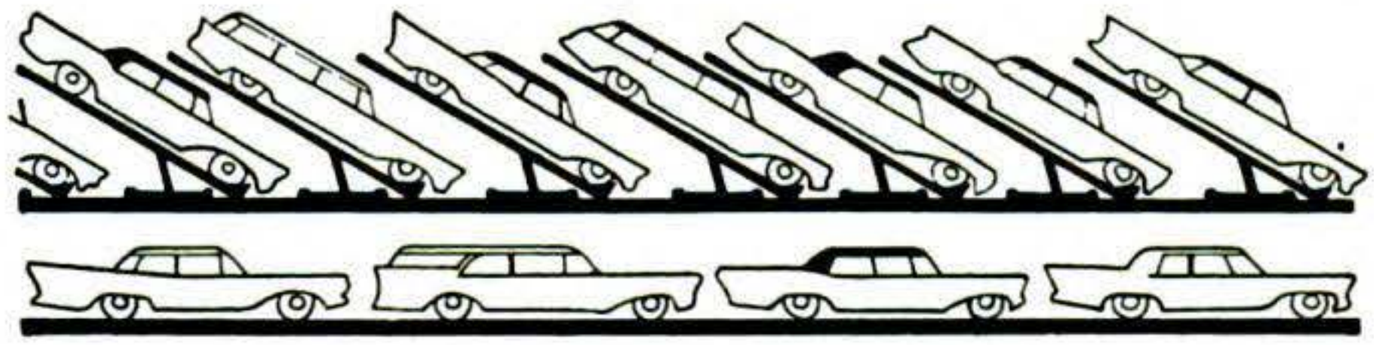
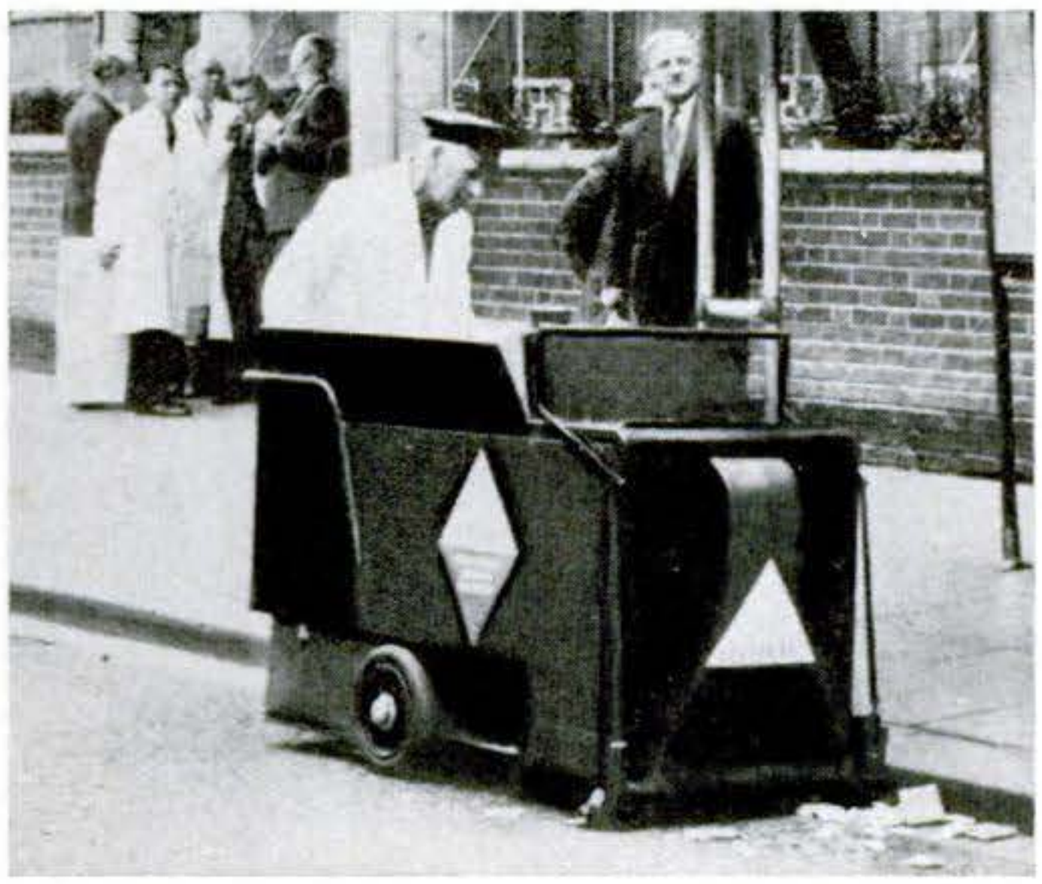
Stacked at an angle, seven cars can be parked in the same space that four ordinarily occupy.

CAR TILTER STRETCHES PARKING LOT



In this parking lot, a motorist drives onto a rack. When he gets out, the attendant lifts the rear end of his car 30 degrees on a hydraulic jack. Then he rolls tilted car and jack sideways on rails to its parking place. The Auto-Pack System was developed by All American Engineering Company, Wilmington, Del.



STREET VACUUM. The cleaner above may be useful around home as well as on streets. It has a centrifugal system that separates litter and dirt as it sweeps, works on a 1¾-hp. gas motor. The vacuum is being tried in London.

WHIRLY-PROP. Fairchild will build this three-bladed autogiro for commercial sale by the Umbaugh Aircraft Corp. It has conventional helicopter rotors for vertical lift, plus an airplane power plant and propeller for forward flight.

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The Fabulous and Deadly B-70

EARLY in 1962, this weird-looking bird, the world's fastest bomber, is due to try its triangular wings. Enough details have now come out to make possible this artist's conception.

The Valkyrie, as the Air Force calls its 2,000-m.p.h. B-70, will be a lethal blend of plane and missile. Driven by six jet engines, each developing 25,000-lb.

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thrust, it will fly intercontinental missions in incredibly few hours without refueling. It will be able to deliver a massive H-bomb load. In addition, it will carry nuclear missiles designed to dart off at other targets 1,000 miles away.

The B-70, being built by North American, will flash so fast through the thin, frigid air 70,000 feet or more above the earth that its skin temperature will rise several hundred degrees. But its four-man crew will be snug in a sealed cabin.

About 170 feet long, the 250-ton bomber will have a span of around 115 feet. Stubby frontal controls and two tall tail fins will help it maneuver. It will protect itself with electronic devices instead of guns.—*Wesley S. Griswold.*

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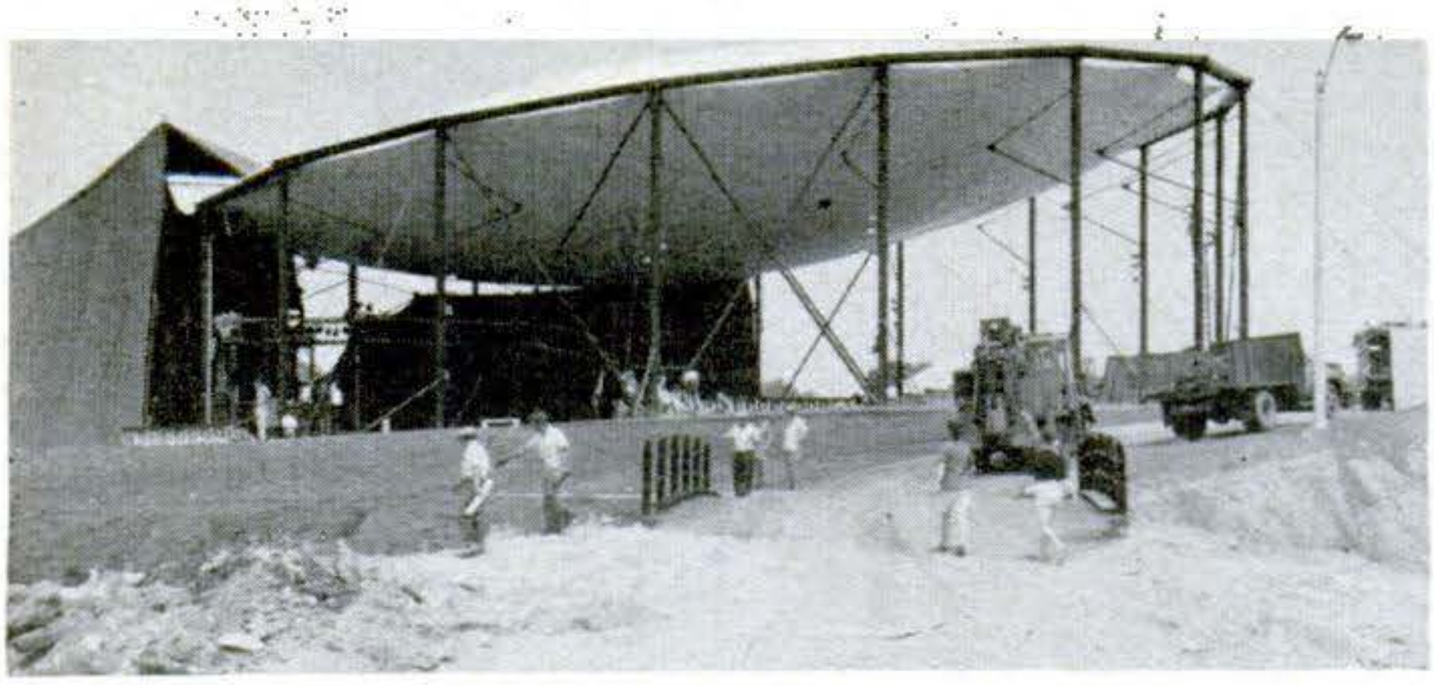
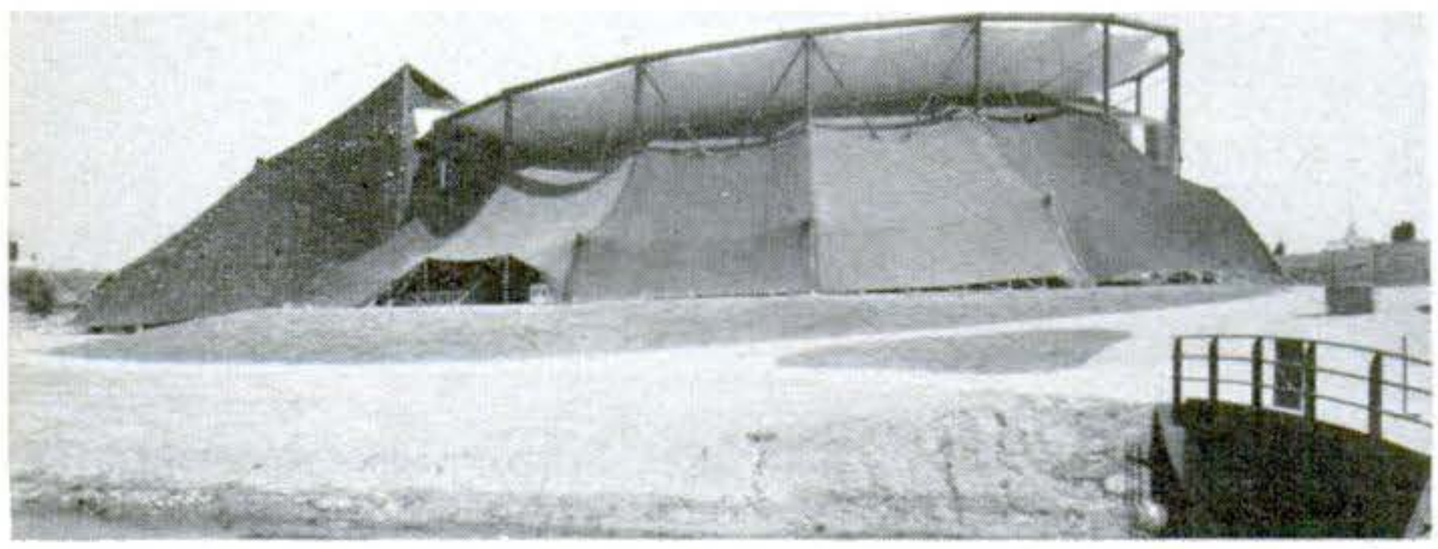


Roof is in place and inflated. It's held up by 18 pipe columns.



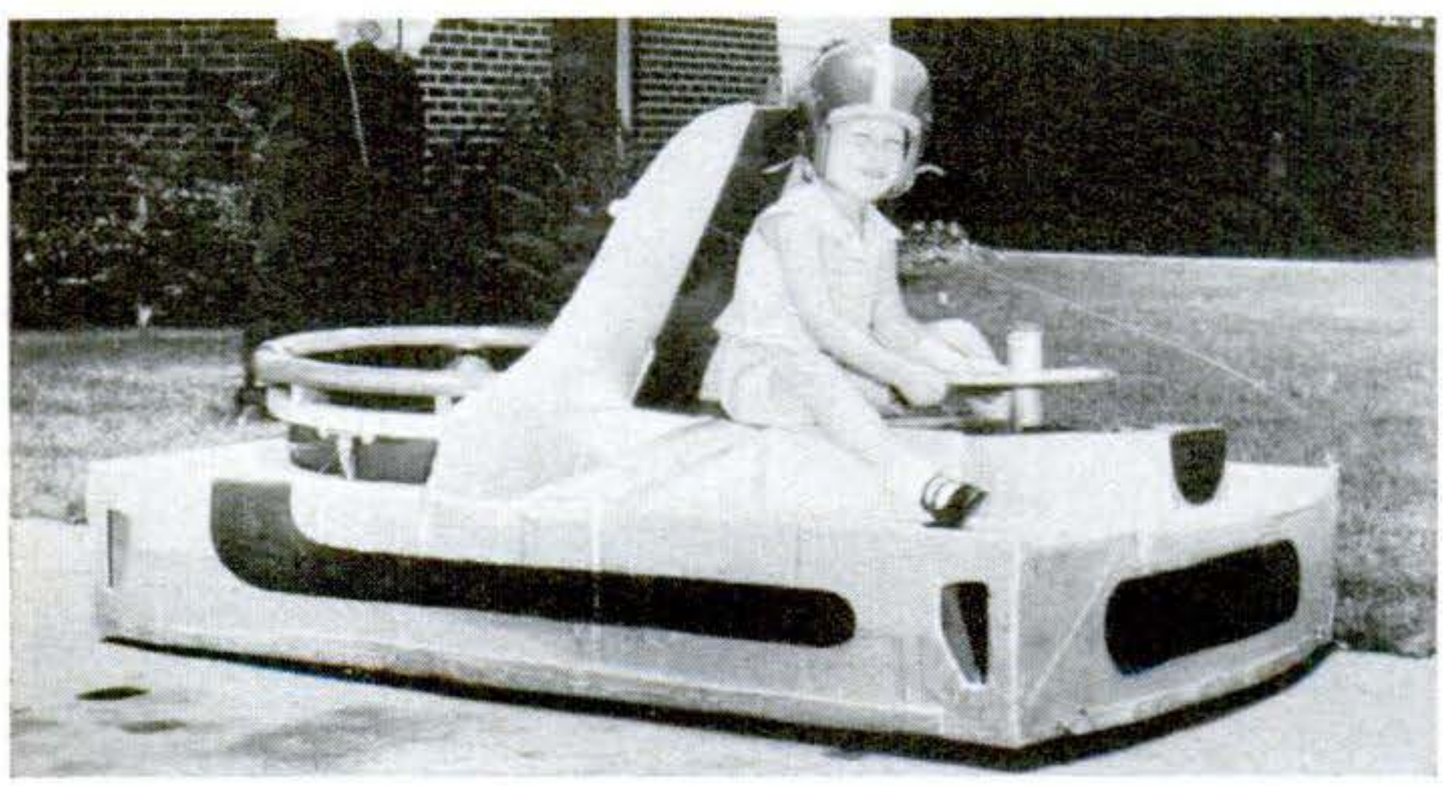
Here is the completed structure: a tent with no center poles.

EVERYBODY'S SEAT IS GOOD IN THIS TENT

The structure at left, for the Boston Fine Arts Theater, started out to be a tent. But tents, with center poles and such, can't furnish an unobstructed view for a large audience.

So the architects built a steel ring, 145 feet across, with 18 pipe columns to support it. They covered this with a disk-shaped vinyl-coated nylon balloon, 26 feet deep at its center when blown up. Then they draped the sides with canvas and added a tented stage.

The air-filled roof does more than just keep off rain: It offers fine insulation against the heat of the summer sun.



RIDING ON AIR. Two research engineers for Bell Helicopter built this air-cushion car for their sons. It travels on a cushion of air from a ducted fan [PS, July].

It was built on a frame covered with cardboard and cost about $2. However, the ducted propeller was borrowed from the company laboratories. To buy it would take several thousand dollars.

BABY JEEP. Here is a utility car you can buy for $1,350. Looking like a jeep that shrank, it weighs only 1,100 pounds. Overall length is 111 inches, wheelbase 63 inches, tread 40 inches.

Crofton Marine Engine Co., San Diego, makes it, calls it a Bug. It runs on a 35-hp. four-cylinder Crofton engine. Dual rear wheels give it good traction even on sand.

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Hottest New Compact Car

Bigger in body and engine than other compacts, Valiant offers high performance, good mileage

By Ken Fermoyle

FROM a secret redoubt in farthest Detroit, a Chrysler task force last month launched a dashing new battler into the five-way compact-car free-for-all.

Chrysler's Valiant is "small," but it's a cat of a different breed. It's bigger than GM's Corvair, Ford's Falcon and Studebaker's Lark, but it's smaller than the Rambler. It outweighs the Corvair and Falcon, about matches the Lark Six, and is 300 pounds lighter than the Rambler Six.

It packs more power than the Corvair

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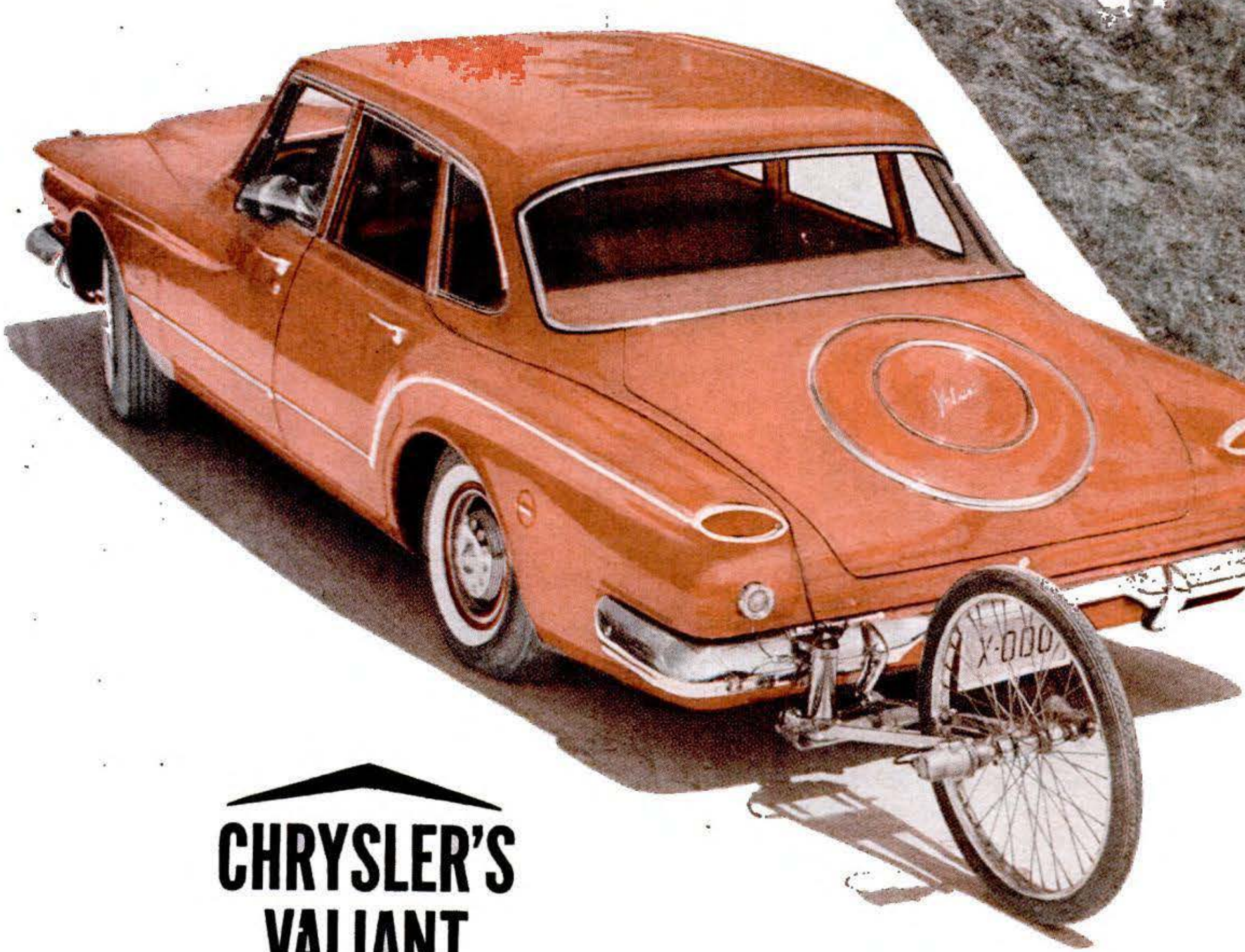

CHRYSLER'S VALIANT

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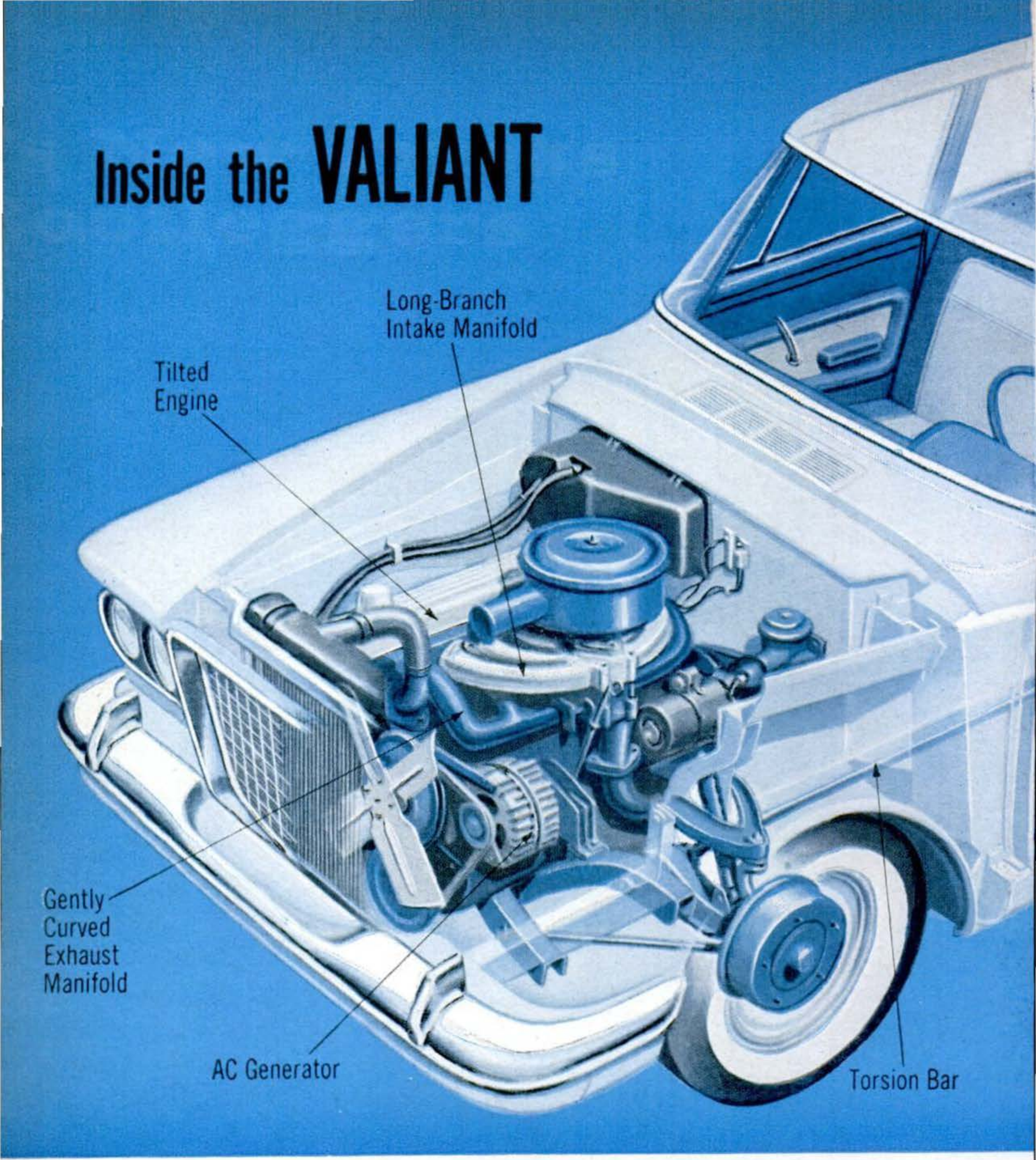
Inside the VALIANT



or Falcon or Lark Six, but less than the Rambler Six.

The Valiant has zip. The styling is flashy, with a European tang. It breezes away from a stop light to 60 miles an hour in 15 seconds, thanks to the husky engine—an OHV six that gets 109 hp. out of 171.1 cu. in. (3 2/5-in. bore, 3⅛-in. stroke).

Gas economy? The penalty for weight and performance is mileage a bit less than Corvair's or Falcon's—but more than the Rambler and Lark sixes. Official claims mention 25 miles per gallon of regular gas.

Engineering innovations include an engine that is tilted and a generator that makes AC instead of DC.

Handling can't be faulted. The Valiant rides its own version of the Chrysler

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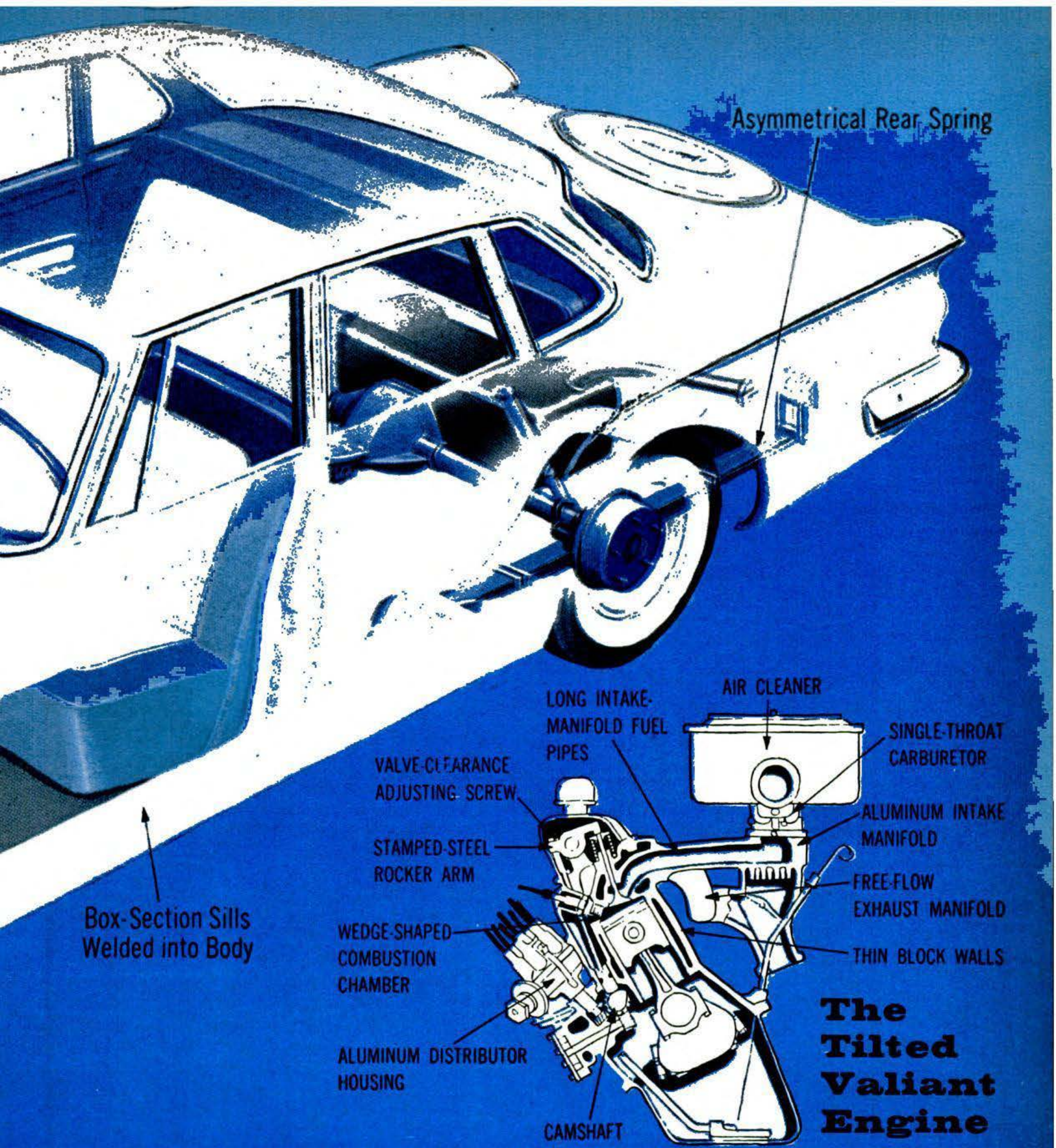

The Tilted Valiant Engine

suspension: torsion bars up front and wide-based leaf springs at the rear. The car stays flat and upright, without body roll or sway, even when cornered fast and furiously.

Steering is light and quick. It takes just 3½ turns of the steering wheel to turn the front wheels from full right to full left. You can get power steering, but you don't need it.

Familiar Chrysler pushbuttons control the optional three-speed automatic transmission. It is modeled after the Torqueflite gearbox used in the corporation's big cars, but is lighter by more than 100 pounds.

The Valiant is billed as a six-passenger car—and it comes about as close as most standard-size automobiles. With a full load aboard, however, the middle pas-

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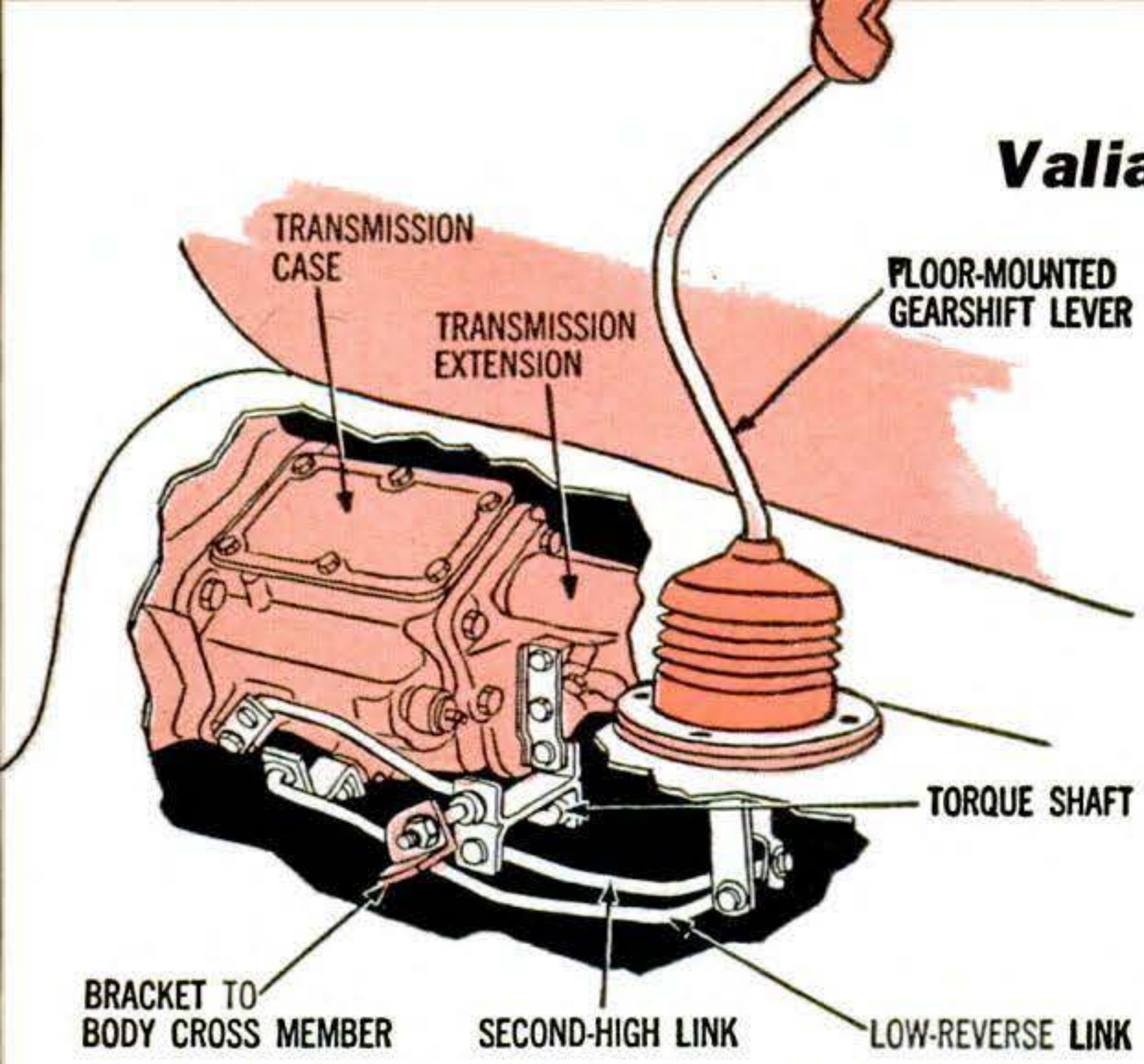


FLOOR-MOUNTED SHIFT LEVER on manual-transmission models complicates life for the middle passenger when three are in front, but makes for easy shifts. Lever throw between gears is short and positive. Automatic transmission modeled after Torqueflite is optional.

sengers had better be small or the ride short.

The big look outside (184 inches long, 70 inches wide, 54 inches high) gains the passengers extra leg room inside, but not much else. Front leg room (44.4 inches) beats both Corvair and Falcon. Rear leg room (38.9 inches) exceeds Corvair's by more than three inches, but falls short of Falcon's.

Hip room is 57 inches front, 56.9 rear. This compares with 57.8 front and 57.6 rear for the Corvair, 57.1 front and 57 rear in the Falcon.

The seats are comfortably high: 11.4 inches front and 13.4 inches rear. They slope deeply—you sink right into them—to provide more usable head room than the figures (33.6 inches front and 33.4 rear) suggest.

The 25 cubic feet of luggage space is more than double Corvair's, but just a fraction more than Falcon's.

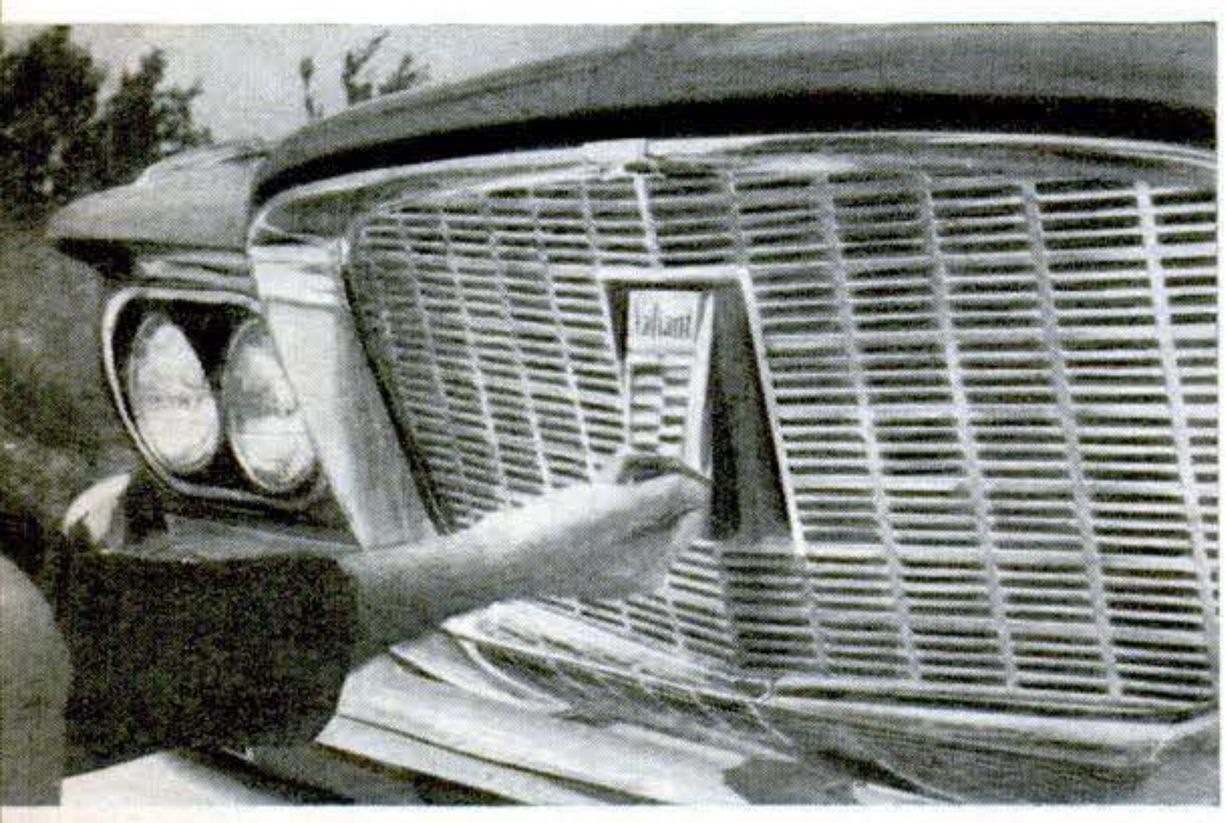
It's easy to get in and out of the car. The doors open 88 degrees, and the sill-to-roof gap is even bigger than in standard-size cars.

Inside, the Valiant is simple but not cheap. The plain dash has a circular speedometer recessed in a nacelle to the left, gauges in a matching nacelle to the right. If you go for the fancier V-200 series, you get 2½-inch foam cushioning on the front seats, flashy vinyl and nylon upholstery, and carpet on the floor.

Under the hood. Up front you see more striking differences from Corvair and Falcon. Valiant went to the leaning engine because it lowered the hood line (the stylists liked that), gave a low center of gravity, and left room for an improved intake manifold (the engineers liked *that*).

Tilted engines began showing up in Indianapolis race cars—they call 'em "sidewinders" there—some years ago. At first they had oiling problems. Valiant engineers claim they've had no such difficulty.

Intake and exhaust systems also smack of racing practice. The right-tilting engine leaves room for a long-branch manifold on the left. Six long, gently curving tubes of nearly equal length route uni-



PULL OUT THE GRILLE EMBLEM—and you unlatch the hood. It is low, for the European look, ending in grille reminiscent of Chrysler 300E.

YOU PUT THE GAS IN at the left rear fender. It'll take 13 gallons, which the company claims is enough to propel the Valiant 325 miles.

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form amounts of fuel to each cylinder—eliminating the uneven fuel distribution common in sixes. Casting the manifold from aluminum cuts weight, keeps the fuel charge cooler and denser than cast-iron manifolds.

A six-port exhaust system works with the intake manifold to eliminate engine asthma. None of the exhaust ports is "Siamesed" to serve several cylinders, as they are in most sixes.

The cast-iron engine block is light for its displacement. Modern casting techniques keep wall thickness to a minimum. Extensive use of aluminum also helps.

In addition to the intake manifold, the generator and distributor housings, pistons, water-pump housing, oil-pump housing, oil-filter pad and water-outlet elbow are all aluminum castings. The clutch housing, transmission extension and entire automatic-transmission case, including the torque-converter housings, are also aluminum die castings.

AC into DC. Another engineering surprise is the AC generator. (The car doesn't use AC; six silicon diodes rectify the alternating current into standard 12-volt direct current.)

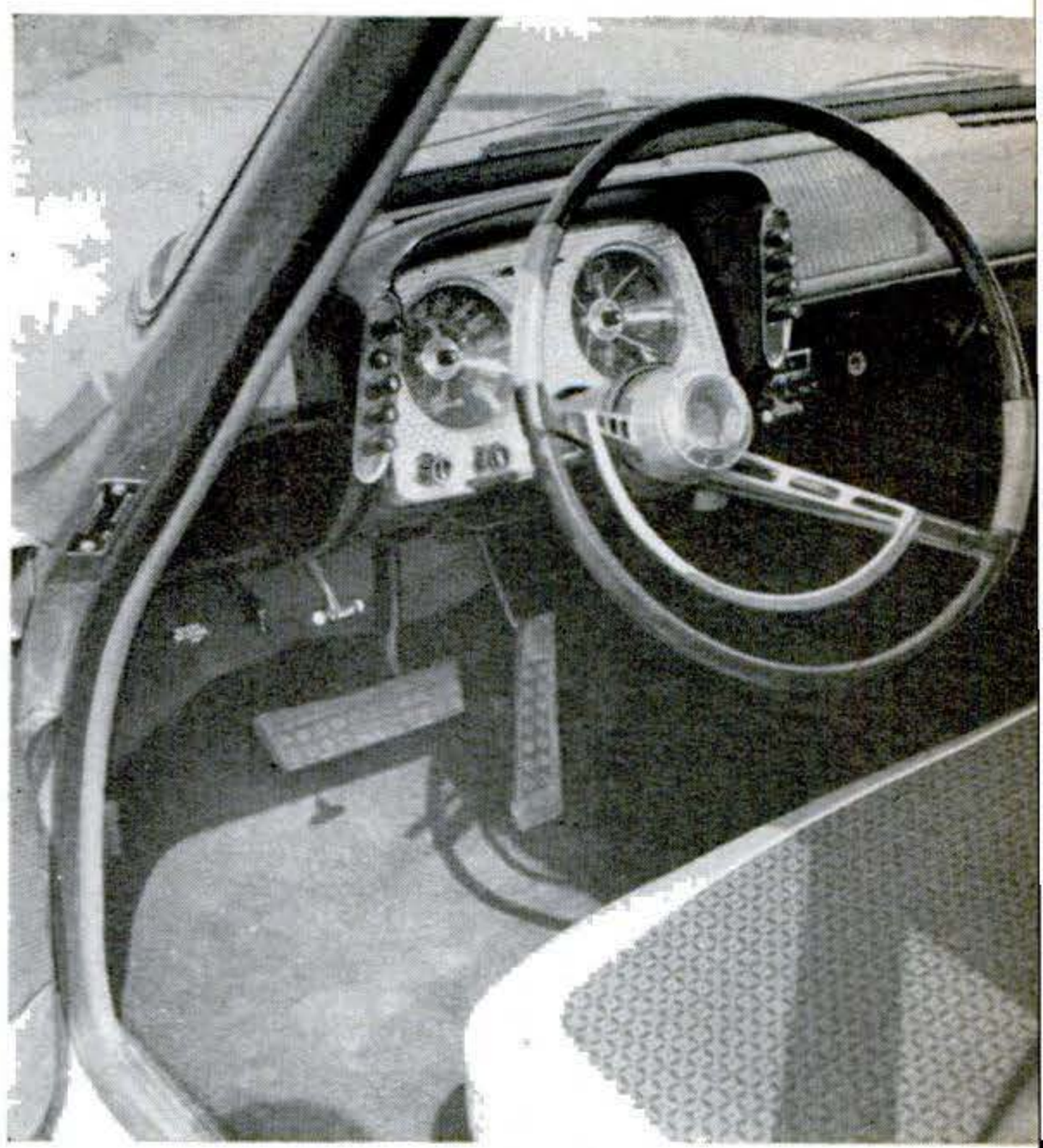
One reason for the change is accessories. DC generators produce no current when the engine is idling. AC generators do (this one can crank out 10 amps at idle, builds up to 35 amps at higher speeds).

So the alternator means you can play your radio and run the heater while poking through traffic without worrying much about dragging down the battery.

As a fringe benefit, the alternator is light. It saves 9½ lb. over a DC generator—partly because a lot of aluminum is used to build it, partly because the field (the heavy cylindrical outer part of a DC generator) is the rotating member and therefore is smaller. It needs no cutout; the diodes prevent reverse current flow.

Vibration control. Valiant engineers burned lots of midnight oil designing the engine-mounting system. When they were finished, they had not only done much to isolate engine and drive-train vibrations from the car body, but they'd also put the engine to work as a dynamic vibration damper.

The front mountings are shear-type.



IT'S EASY TO GET INTO, thanks to generous door opening and straight doorpost, without knee-catching dog-leg. Interior fittings are simple and attractive. Buttons to left of instrument cluster control automatic transmission, ones to right control heating-ventilating system.

The rear mounting, which supports the rear of the transmission, consists of a single block of rubber bonded to steel plates attached to a bolted-in cross member.

The engine mountings are "tuned" to the rest of the car structure. This was accomplished by determining the rate at which the structure vibrates most severely when jiggled—"excited" is the term engineers use—by the suspension. Then the engine mounts were designed so that the entire engine vibrates exactly out of phase with the structure. When the car structure bounces up, the engine pushes it down; and vice versa.

More than 5,300 spot welds and seam welds join the hundreds of steel stampings in the Valiant's unitized body. Box-section reinforcements distribute driving, braking and suspension loads.

Valiants come in two series: V-100 and V-200. They're identical in dimensions and machinery. The V-200 models simply have deluxe trim and appointments. Each series includes a four-door sedan and two four-door station wagons.

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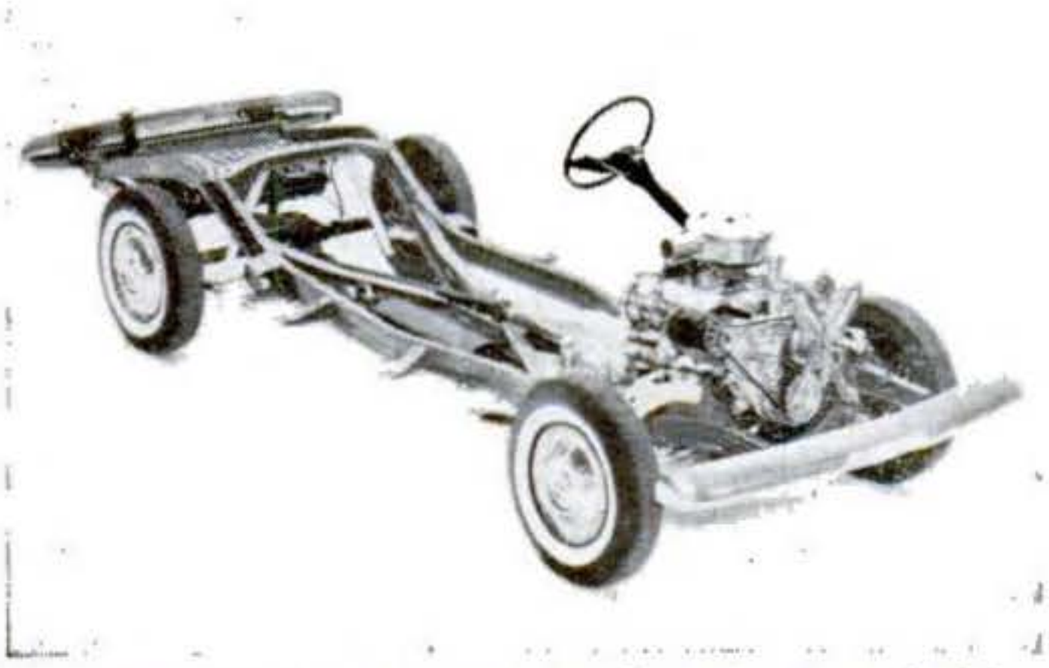
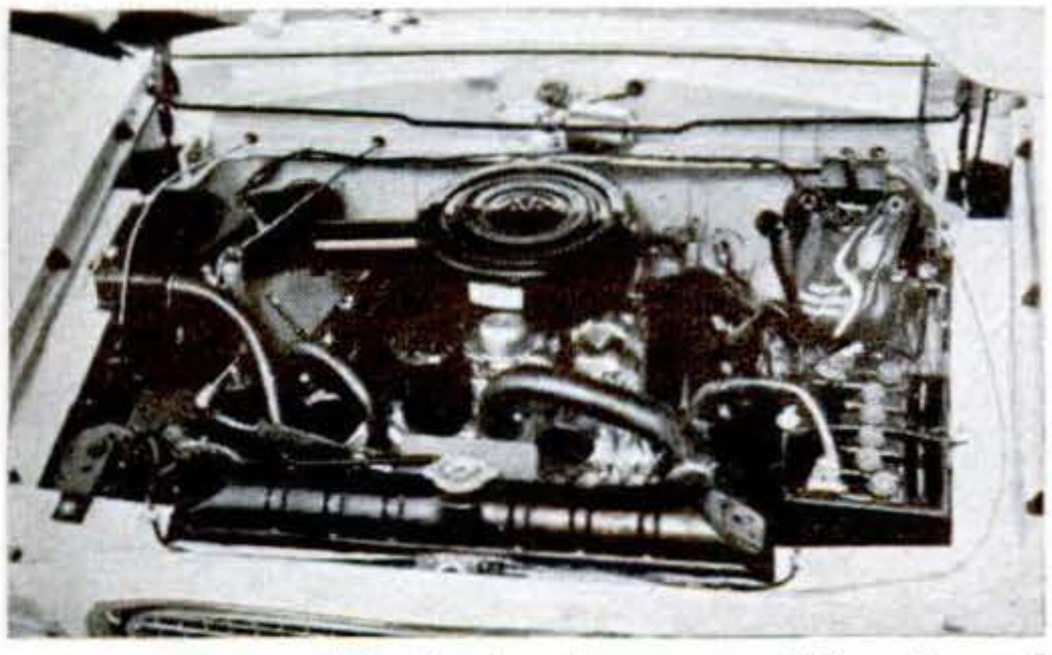
Original Compact Cars Slicked Up for '60

Lark's grille, with emblazoned emblem, has new chrome finish. Instrument panel is restyled.

A CONVERTIBLE, first by Studebaker since 1952, is one of the additions to the Lark line.



CONVERTIBLE'S FRAME is box-section ladder type with heavy, stiffening member in center.



V-8 ENGINE, with dual exhausts and four-barrel pot, produces 195 hp., up 15 from '59.

LUGGAGE COMPARTMENT, containing 16.5 cubic feet, is generous for meager rear overhang.

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THE U.S. cars that started all the ruckus over size and fuel economy appeared in showrooms last month in their 1960 attire. For automobiles that pride themselves on being as unchanging as the tides, the Rambler, Rambler American and Lark exhibited surprising alterations.

All three come in new models. All have undergone alterations in looks. All have expanded their packets of optional accessories. The modest little American presented a shocker—power steering at, of course, extra cost. The modest little Lark upped its horsepower.

A new convertible, a new station wagon and a new four-door sedan comprised the centerpieces of the American Motors and Studebaker-Packard Corp. displays.

Rambler

New fins, decorative spears and creases on the roof and deck lid identify new Rambler.

INSTRUMENT PANEL is new. Windshield and rear-window pillars are slimmer and slant more.

FOUR INCHES SHORTER, like all '60 Ramblers, new three-seat wagon has a side-hinged door.

American

FOUR-DOOR SEDAN is newest addition to Rambler American's stable of cars. Among the options: air conditioning. Among the changes: easier-access doors, more glass, larger fuel tanks, and brake linings that are bonded instead of riveted to the drums.

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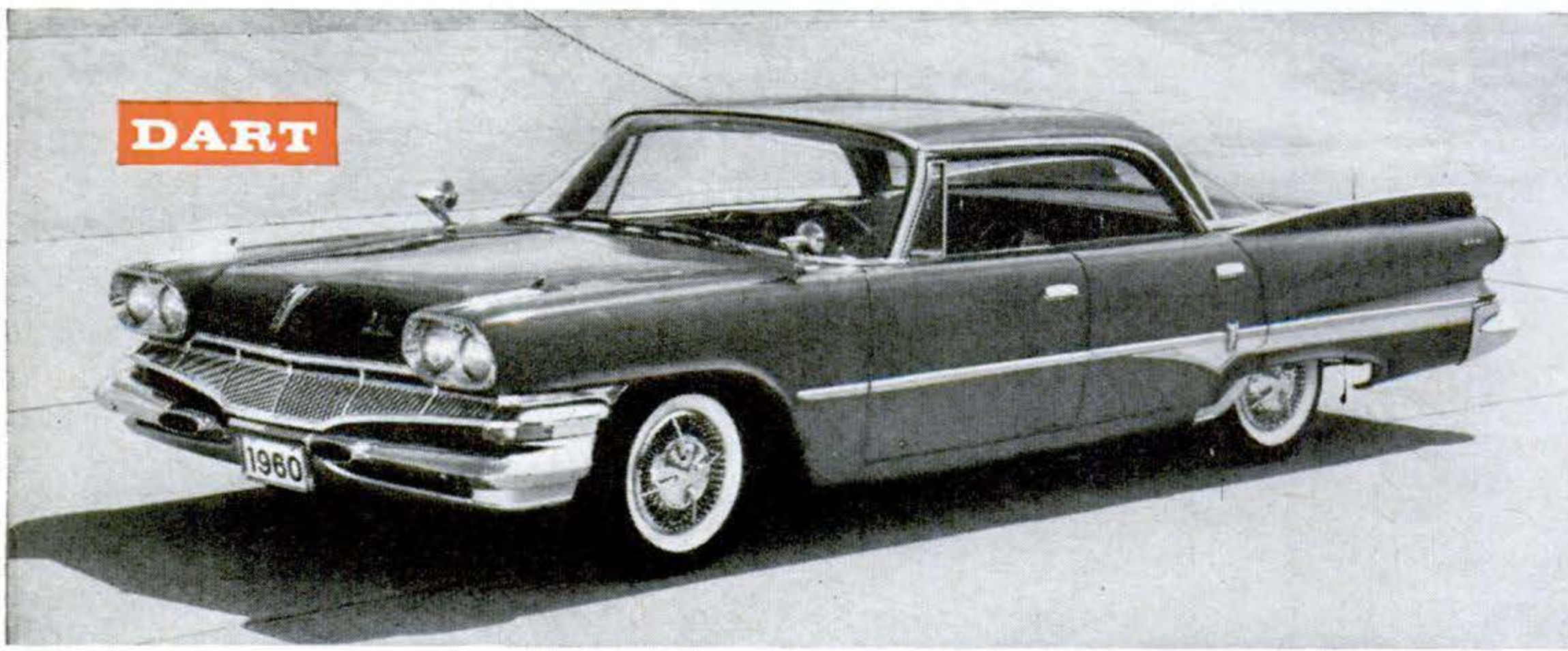
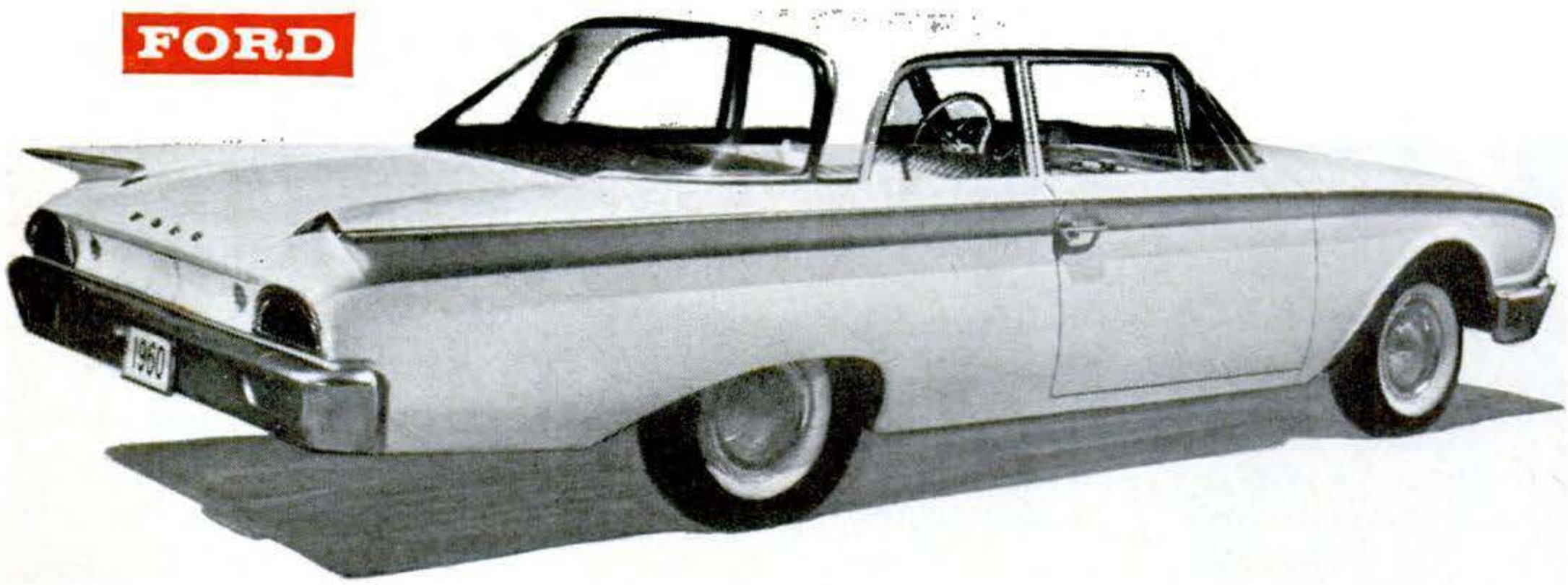
Priced just above the "compacts," these cars give you a wide choice among—

Detroit's New Five-of-a-Kind



If you hanker for a Dodge at a lower price, with a bit less floss, this is it.



Completely restyled, it has a ridge of projecting sheet metal at the waist line.

By Devon Francis

ON THE first of this month U. S. motorists were richer in choices of domestic cars than they had been in a quarter of a century. With all Detroit's 1960 tinseled hardware on showroom display, the tally was impressive. There were 26 different names to choose from. Not since 1934 had there been so many homegrown brands on the market.

There was another fact of even more importance. Motorists had a bigger choice in the lower-priced group of vehicles—where seven out of every 10 cars are sold—than they had had in many a year. With dealer discounts, there were

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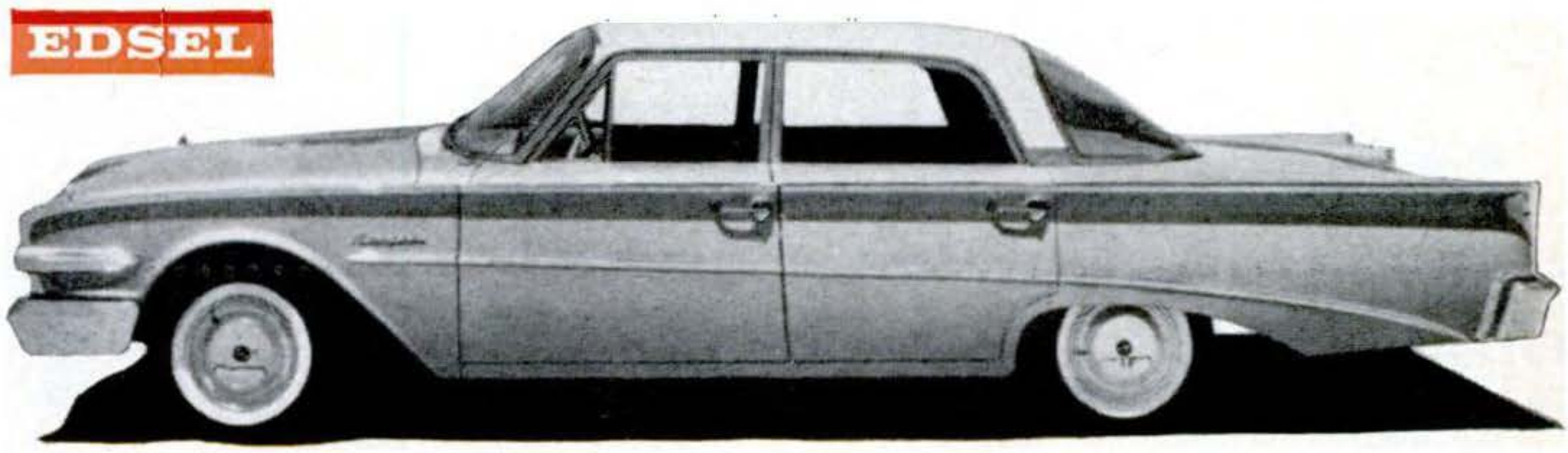
With minimum changes in the basic car, Chevy now offers new operating economies.



All dimensions have changed—it's a lot longer and wider, and a full inch lower.

For 1960, doors are bigger, and better contours reduce wind resistance.

11 brands that could be bargained-down to $2,000 or less.

Motorists had not seen a brand spectrum that wide—bearing in mind the relative prices of cars, not the specific dollar-price, swollen by inflation—since the mid-1920s.

The main reason for all this, of course, was the introduction of Detroit's new, small, low-priced cars, the Corvair, Falcon and Valiant. There was a fourth newcomer, the Dodge Dart, at a somewhat higher price.

These freshly minted names were bracketed with seven cars already prominent on America's automobile rows—Chevrolet, Edsel, Ford, Lark, Plymouth, Rambler and Rambler American. Most

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of these were available at substantial cuts under the "factory-suggested advertised delivered price."

The Chevy, Dart, Edsel, Ford and Plymouth are, as a poker player would say, five of a kind. All are lower-middle-price cars that can be horse-traded down to a price of $2,000 or less if the customer doesn't insist on a V-8 engine and such geegaws as an automatic transmission

Chevrolet

THE Chevy people have been content with refinements of their 1959 design. Prow and stern are restyled. The transmission tunnel is an inch and a fraction lower in the front compartment and an inch and a half narrower. The car is quieter—rubber body mounts are huskier.

One useful gimmick is a simple your-brakes-are-on warning: When you set the hand brake, the release handle pops out.

Following the current trend, Chevy has reduced axle ratios. This will make for

Dart

DODGE'S new Dart is to the Plymouth what the Edsel is to the Ford: Each pair of cars shares some sheet metal and a lot of mechanical innards. The only reason for creation of the Dart was to give Dodge dealers another car to sell—the Plymouth does not appear in Dodge showrooms in 1960.

The Dart is a smaller Dodge or a slightly fancier Plymouth. It shares Dodge's styling fore and aft, and such items as a speedometer mounted atop the

Edsel

IN THIS, its third year, the Edsel is wider and longer, to distinguish it from the Ford. But it shares with Ford a complete lack of front fenders—if, indeed, fenders could be called fenders at all in the last dozen years. Sheet-metal plates, simulating fenders, now bolt at the sides of a hood so wide that it staggers the eye. This is going to delight mechanics leaning over the sides to ply their surgery on engines.

The body metal is all new. Most of the windshield-post dog-leg, introduced when all Detroit was in hysterics over wrap-around glass, has been eliminated. This gives front-seaters an entrance area almost 10 inches wider.

Like the Ford, the Edsel has a long list of new mechanical features. One of them is a radiator that makes the water flow crosswise instead of up and down. That's necessary because, as hoods have become lower and radiators squattier, the engine fan has covered less of the radiator area. Laying the radiator on its side, in effect, is one solution to the problem of better cooling.

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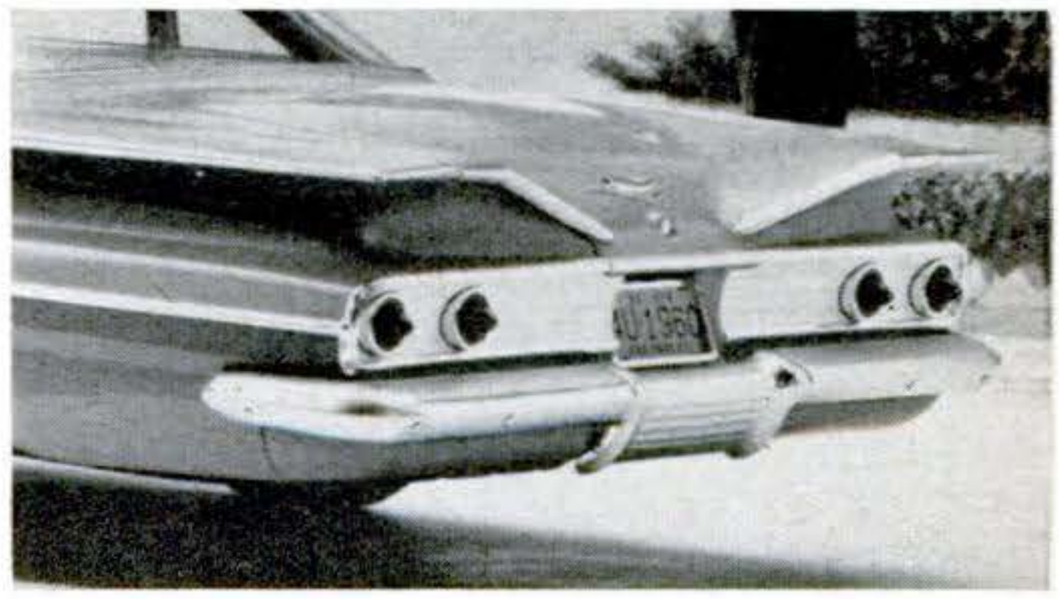
and power steering. All offer fairly muscular six-cylinder engines. All weigh 3,500 pounds and up. All are cars of big dimensions in the sense that Dodges, De Sotos, Mercuries, Buicks, Pontiacs and Oldsmobiles are not much bigger, and that the new small cars are a lot smaller.

Let us here, then, have an alphabetical look at these five cars as they affect your new-found smörgåsbord choice of a buy.

better gas mileage. The camshaft on the 283-inch standard V-8 is redesigned for the same reason. The paper carburetor air filter, hailed as a new technological breakthrough by several manufacturers two years ago, is now discarded by Chevy in favor of a permanent, oil-wetted element. And you'll have to remember about the new gauges. The needles don't go to zero when the ignition is switched off. They float freely and may indicate almost anything.

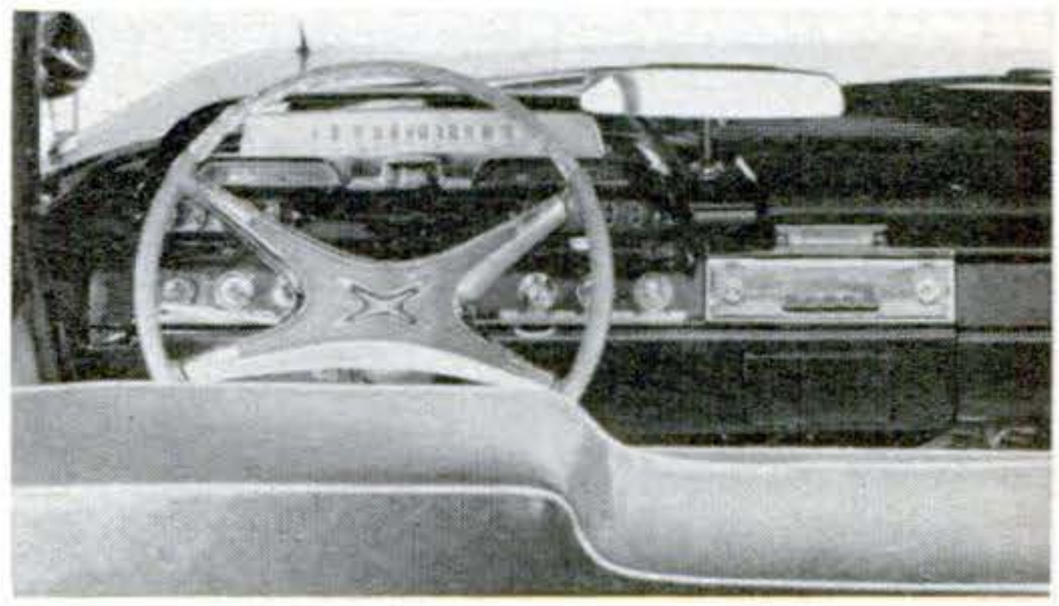


MOST STRIKING STYLING CHANGE is disappearance of cat's-eye tail lights, new dog-leg fins.

instrument panel, for easier viewing, and a straightened middle body post on four-door hardtops for more entrance room.

It shares with Plymouth the bigger of the two canted six-cylinder engines described in October POPULAR SCIENCE.

It also shares the Chrysler family's fresh engineering developments—lightweight automatic transmission, redesigned rear shock absorbers, quieter door latches, softer engine mountings and easier steering. It has a modified unit body.

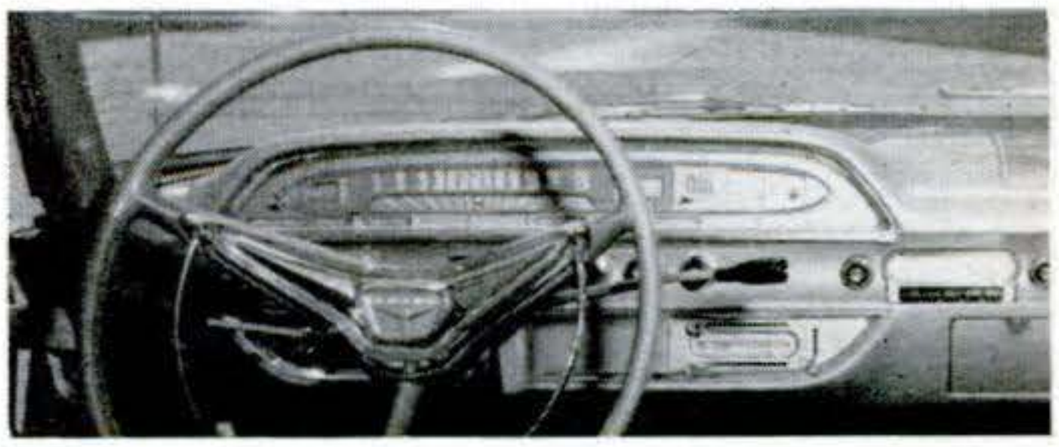


SPEEDOMETER "FLOATS" above instrument panel, and the driver's seat has an extra-high back.

With Ford, the Edsel has an improved automatic choke and a muffler attached far back on the exhaust pipe to keep heat from the passenger-compartment floor in hot weather. A six-cylinder engine is prominent among the options.

Edsel's secret pride, however, has nothing to do with the design of the car. That's a program for bettering its assembly quality, a migraine headache to all auto manufacturers. At Louisville, Ky., where Edsels are put together, there is a man named Al Clark who is professionally bad-tempered. A dozen men under his direction go over each Edsel as it comes off the production line to find fault with it. If something is wrong, back it goes for a fix. Al Clark's bad temper should improve the temper of many an Edsel customer.

FOUR EXCLAMATION POINTS replace gull-wing tail lights. Luggage compartment is bigger.



PANEL'S IGNITION SWITCH has inside terminals to foil thieves who bridge points.

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How They Compare

Specifications below apply to a four-door sedan equipped with six-cylinder engine and manual transmission. All engines listed use non-premium fuel. Figures given are in inches unless otherwise specified.

	HORSEPOWER	TORQUE (lb./ft.)	PISTON DISPLACEMENT (cu. in.)	BORE & STROKE	COMPRESSION RATIO (:1)	HP. PER CU. IN.	CAR WEIGHT PER HP. (lb.)	TORQUE MULTIPLICATION OF TRANSMISSION	STEERING RATIO		DIAMETER OF TURNING CIRCLE (ft.)	BRAKE-LINING AREA (sq. in.)
									MANUAL	POWER		
CHEVROLET	135[a]	217	235.5	3.56x3.94	8.25	.57	27.4	2.1	28	24	40.8	185.6
DART	145[b]	215	225	3.4 x4.125	8.5	.64	26.4	2.2	30.16	19.15	45.2	184
EDSEL	145[c]	206	223	3.62x3.6	8.4	.65	27.1	2.1	31.8	25	40.5	198.1
FORD	145[d]	206	223	3.62x3.6	8.4	.65	25.9	2.1	27	25	40.5	198.7
PLYMOUTH	145[e]	215	225	3.4 x4.125	8.5	.64	26.4	2.2	30.16	19.15	42.2	184

Other horsepowers available: [a]185, 250; [b]230, 320; [c]185, 300; [d]185, 235, 300; [e]230, 305, 330.

Ford

THE latest figures from the Bureau of Public Roads show that the average U. S. passenger car, traveling 9,391 miles a year, gets 14.5 miles to a gallon of gas. At 30 cents a gallon, that tots up to some $50 more a year than if it got 20 miles to the gallon.

Ford's Ford Division, caught up in the gas-economy fever sweeping Detroit, has revised its standard 292-inch V-8 for more miles-per-gallon.

Intake-valve diameters, expanded year upon year, are now reduced. Intake pipes, enlarged year upon year for "better breathing," are now smaller. The result, at low r.p.m., is that the air-gas mixture courses swiftly from carburetor to valves. It stays vaporized. Less gas is used. Low-speed performance is better.

It's an axiom, of course, that an engine that's economical at low speed begins getting asthma at high speed. Ford not only points with pride to the new econ-

Plymouth

THE differences between the Plymouth and the Dart are more apparent than real. They have the same wheelbase, though the Plymouth is eight-tenths of an inch longer overall. They share a new lightweight automatic transmission and that new six-cylinder engine. They are in the same price class.

Most of the contrast between the two cars is in looks. The Plymouth is in sparkling new dress. Its tail fins are higher, narrower, more streamlined.

"And," adds a company publicist, sniffing at competitive automobiles, "they're still vertical."

The car is a little longer, a little wider, and a whopping two inches lower. Rear leg room is improved, but front headroom is down almost an inch. Seat heights —bravo!—are up. Doors are wider brakes bigger, the noise level lower.

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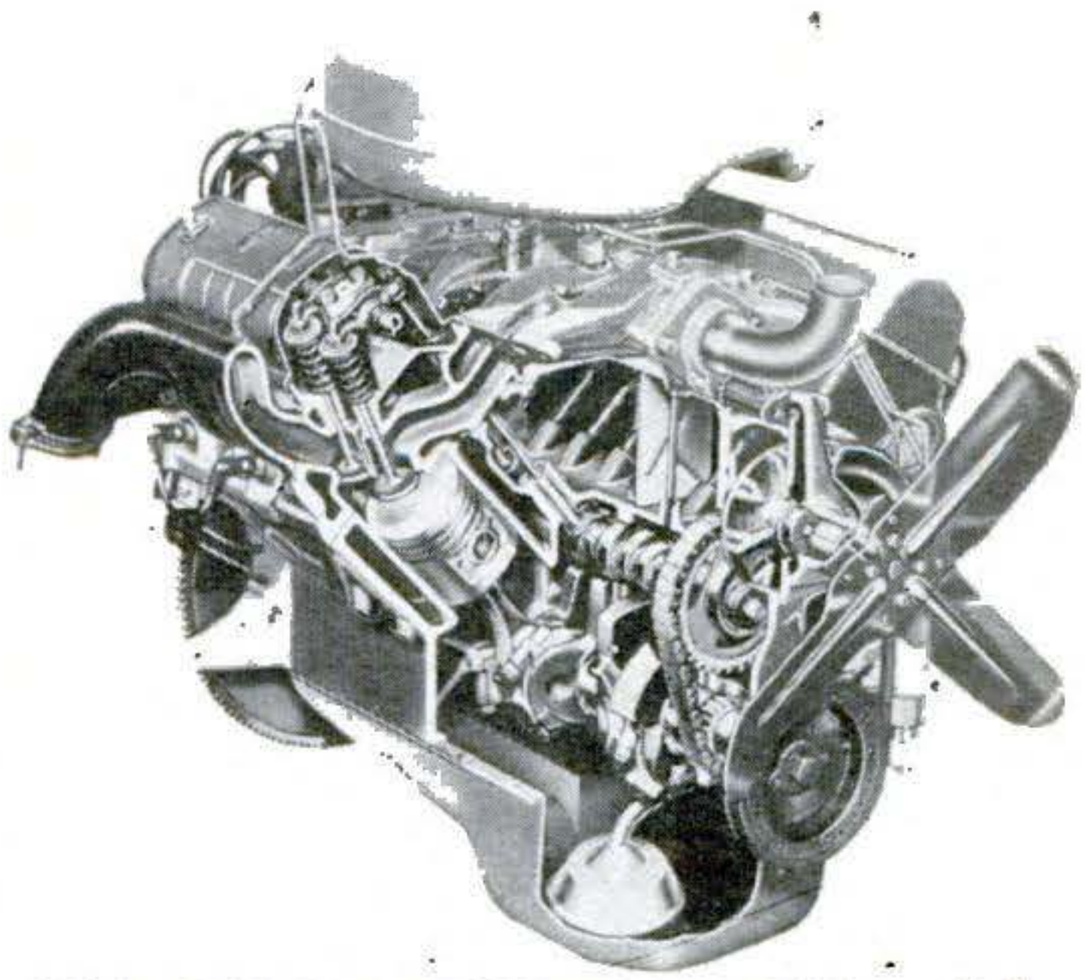
	GROUND CLEARANCE	WHEELBASE	LENGTH	WIDTH	HEIGHT	OVERHANG		HEAD ROOM		SHOULDER ROOM		HIP ROOM		LEG ROOM	
						Front	Rear	Front	Rear	Front	Rear	Front	Rear	Front	Rear
	6	119	210.8	80.8	56	32.6	59.2	36	34.3	60.5	59	65.3	65.4	44.5	42.5
	5.2	118	208.6	78	54.8	33.5	57.1	34.6	34.5	60.4	59.6	63	62.4	46.3	43.5
	5.5	120	216.4	81.5	55	35.6	60.8	34	33.9	59.5	61	62.2	63.6	43.3	41.6
	5.5	119	213.7	81.3	55	34	60.7	34	33.9	59.5	61	62.2	63.2	43.3	41.6
	5	118	209.4	78.6	54.6	33.2	58.2	34.8	34.2	60.4	59.8	63	62.4	45.5	42.6

omy of it's V-8, but underscores its six-cylinder option.

Like the Edsel, the Ford is a new car for 1960. Like the Edsel, it has a wider tread and rear springs that are relocated on the axle to damp out "windup" on hard takeoffs and sudden braking. Brakes are bigger, seats are engineered to the "slouch posture" assumed by driver and passengers, and trim fabrics are fancier than ever.

Ford, with Chevy and Plymouth, further buries the myth of being a "low-priced" car. Look at its dimensions for 1960: 5½ inches longer and 4½ wider. That costs money. The car is also an inch lower. For the incurable showoff, horsepowers go clear up to 300.

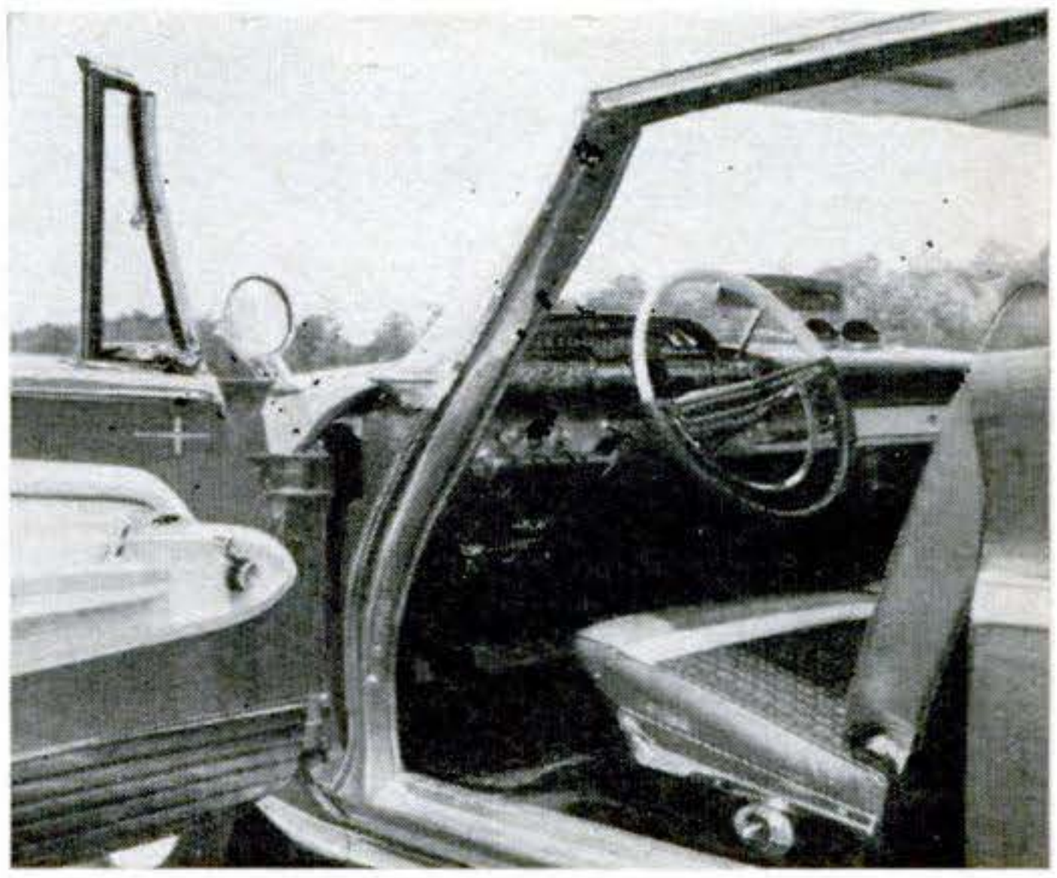


WITH REDUCED INTAKE-VALVE SIZES and improved choke, 292-inch V-8 is standard engine.

It's on gas economy that Plymouth's attitude toward the customer becomes one with those of the new-day Chevy, Dart, Edsel and Ford. Its new overhead-valve six will go farther on a gallon than the hoary, outmoded flathead six.

Much work has been done on body shape to reduce wind resistance. The publicity pamphlets—the "brag books"—state: "Advance testing indicates that buyers may expect to travel eight to 10 miles farther on a tank of gas."

Axle ratios, naturally, are tailored to reduce engine revolutions per mile. For the six-cylinder engine, the ratio is down from 3.73:1 to 3.54. However, the V-8's ratio remains at 3.54.



STRAIGHTENED WINDSHIELD POSTS make entrance easier, and unit body gives more foot room.

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Big and/or Sporty

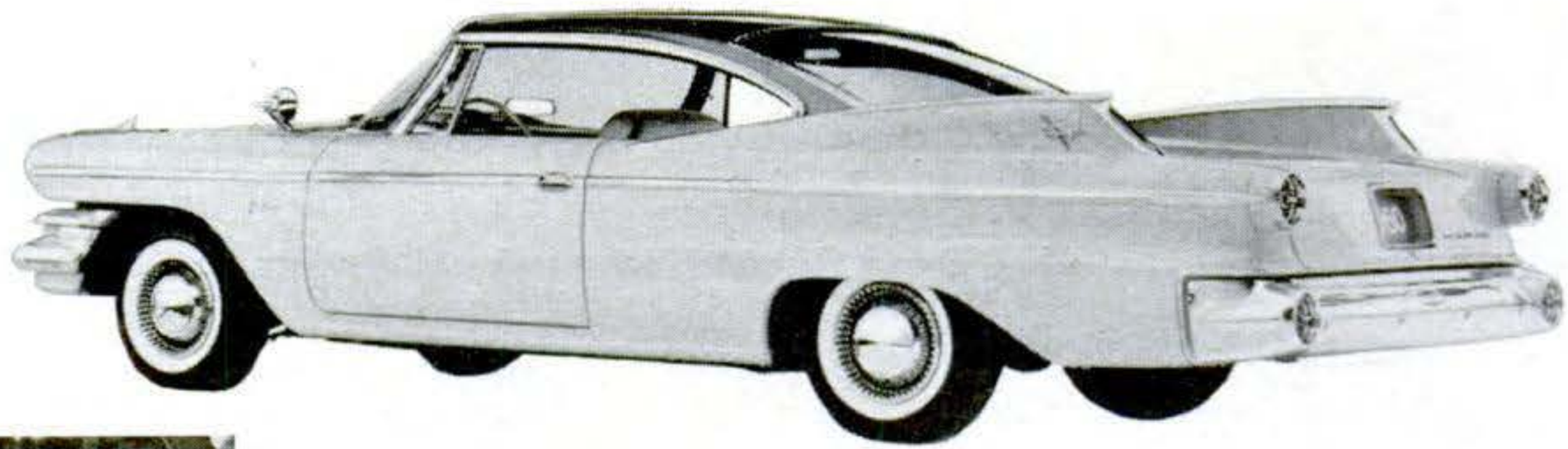
THE big cars are still with us. In its spasm of devotion to little cars, Detroit hasn't forgotten that more than a sprinkling of U. S. motorists like 'em long, low, wide and snorting with horsepower. Some like 'em sporty, too.

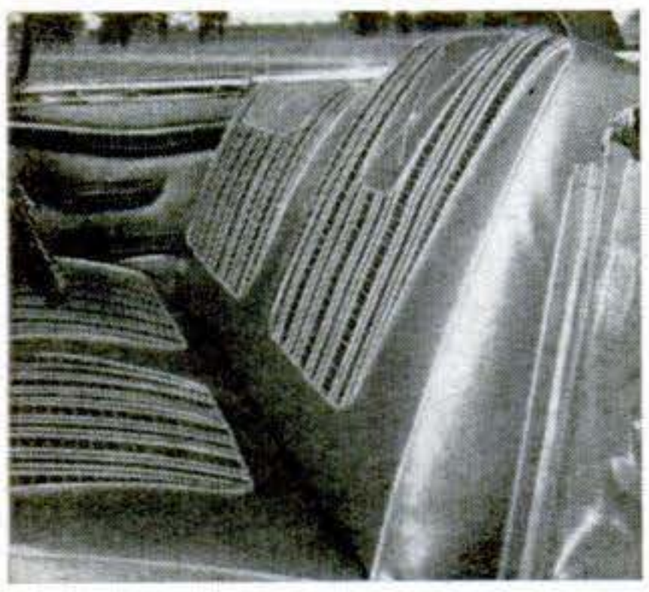
On these pages are the 1960 editions of the bigger cars, the hot cars and the cars for the beret-and-sport-shirt set. The biggest and splashiest of them fairly reek of luxury, but none is without its share of platinum.

There's an instrument panel that, in effect, is adjustable, a carburetor that compensates for summer's heat, and an automatic-release parking brake.

Even here, though, the manufacturers are hedging their bets. Most of them offer something that they haven't plugged in years—more miles per gallon.

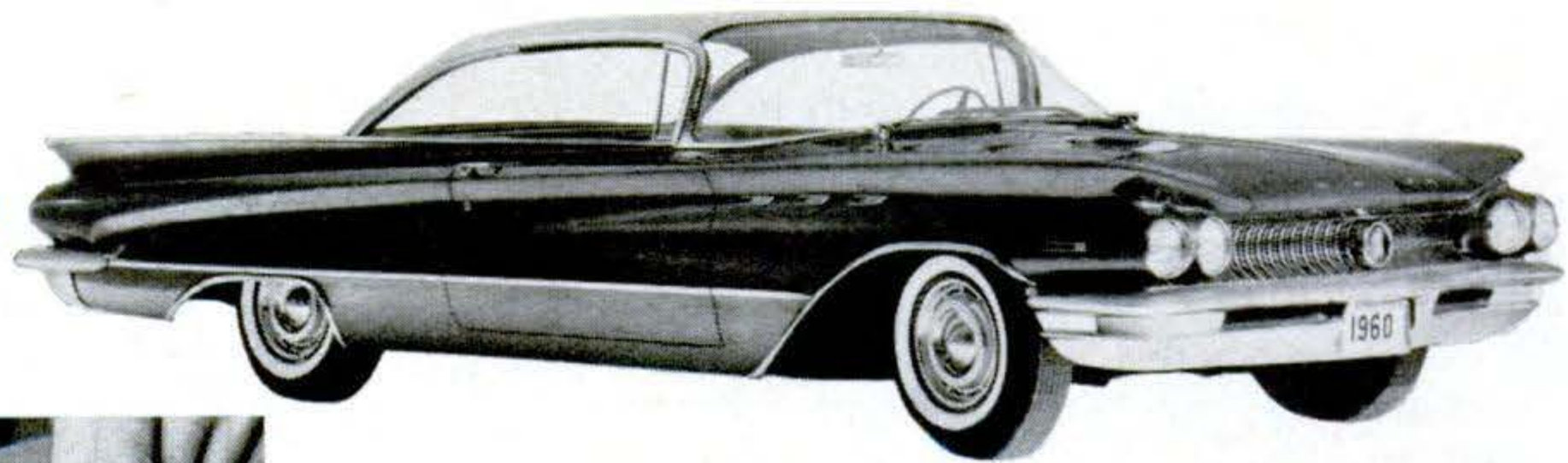
Dodge

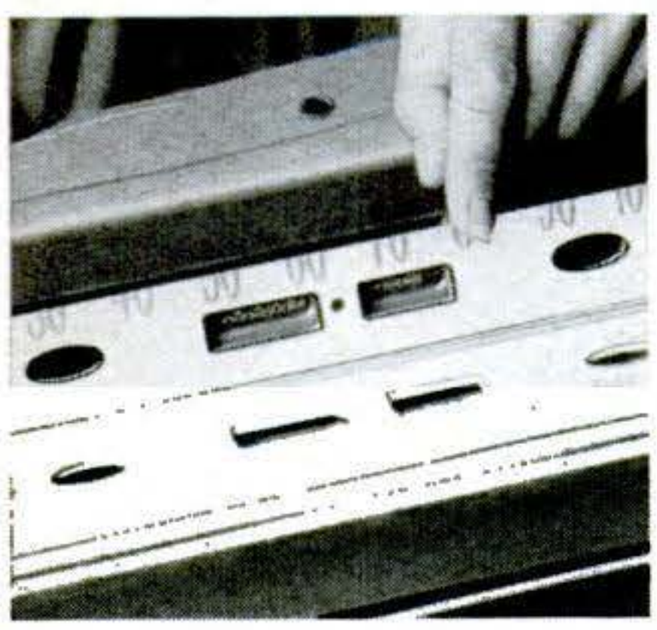




OUTSTANDING styling feature has been those split-level tail fins. The car retains them for 1960. They've been reshaped, though, and look prettier. There also is a new horizontal grille. Doors are wider and higher. There are inches more of hip room for rear-seat passengers and more leg room front and rear. An extra-high seat back gives the driver more comfort. The series names are changed from Coronet, Royal, and Custom Royal to Matador and Polara—one less than last year.

Buick





STYLISTS have kept the Buick's essential shape but given it a "heavier" look. Those make-believe portholes are back. Wheel covers are vented for better dissipation of brake heat. Primary panel instruments are laid flat and reflected in a mirror (left) that adjusts to accommodate tall and short drivers. To fight rust, dual exhausts have a common muffler. This eliminates the "cold side" of the system that collected water during the warmup period and eventually ruined the pipe.

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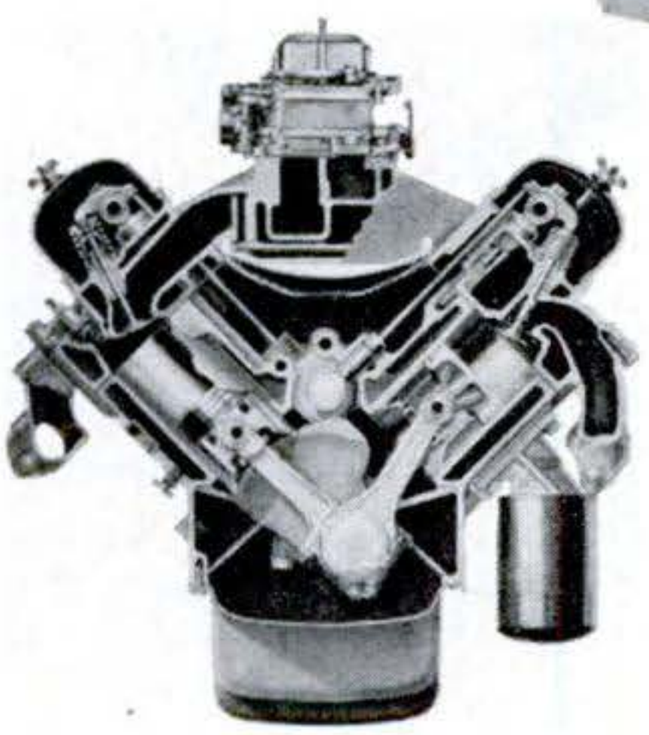
De Soto

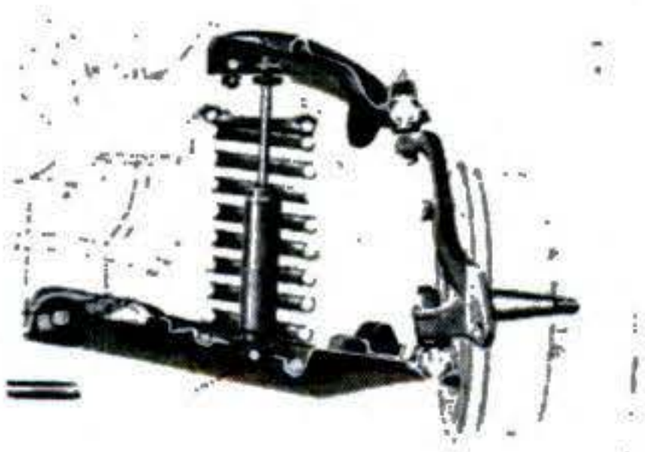
THAT extensive array of tail lights—the flashiest in the industry—is gone. The new ones are just as functional but simpler. No longer are there a 126-inch wheelbase and four series. The wheelbase for the only two series offered, the Fireflite and the Adventurer, is 122 inches. All models have compound-curve windshields, and rear doors open wider for easier entrance.

Ambassador



THE Ambassador has shrunk. Length is down to 198.5 inches, a reduction of 1.65. Height is decreased 1.7 inches to 57.6. Front corner posts have been moved 3.5 inches forward at the base for easier entrance. For better leg room, the panel is farther forward. The standard 250-hp. engine uses regular gas, but an optional 270-hp. job will burn only premium without knock.

Mercury



ALL the sheet metal is new, but that's the least of it. The ball-joint suspension has new antifriction bearings. Two of the three optional engines use regular fuel. Wheels and tires are balanced during assembly. A compensator leans out the mix from carburetor idle jets in hot weather to establish a better fuel-air ratio and eliminate customary low-speed roughness.

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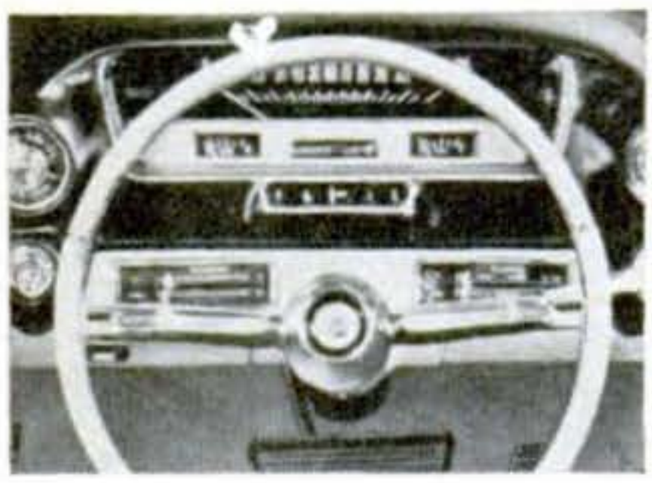
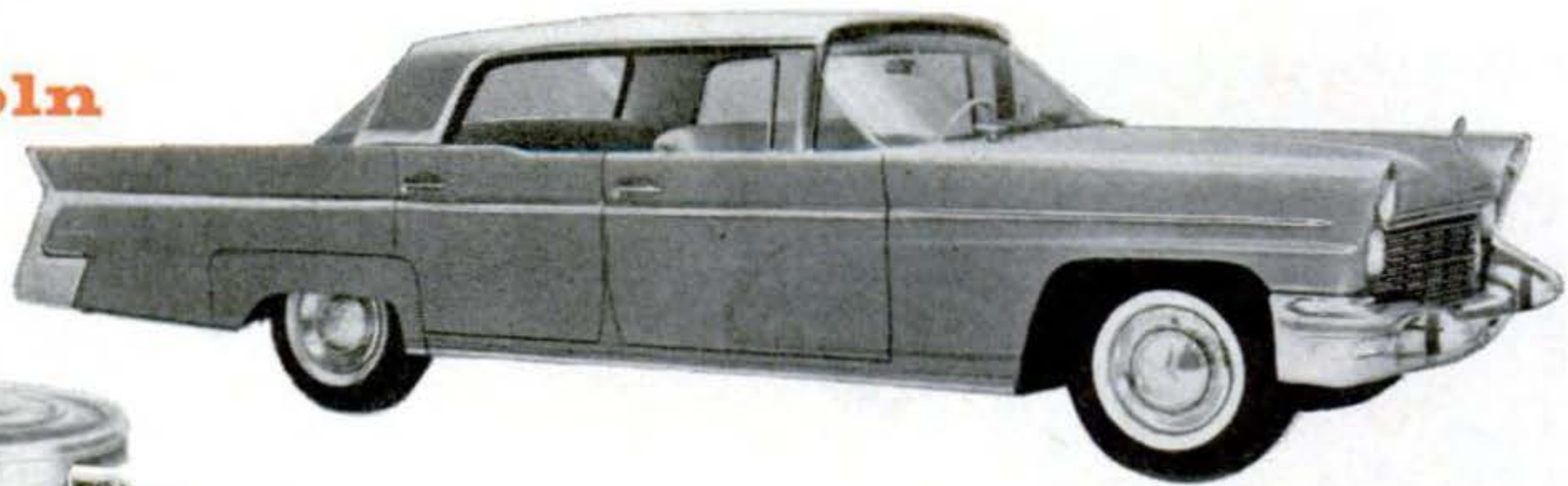
Cadillac



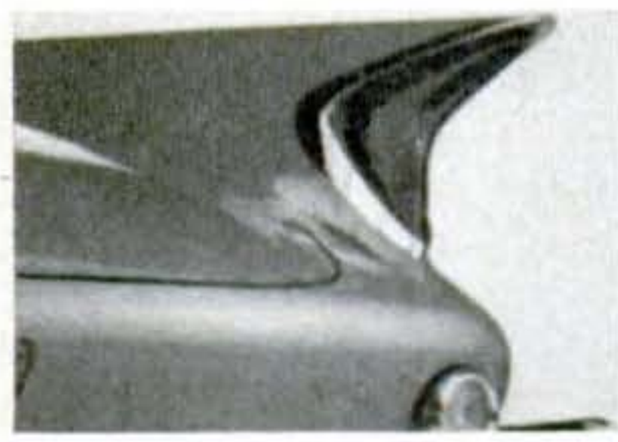
LOOKING less like a missile launcher and more like an automotive queen, the new Caddy is simpler of line. There's a new panel. Finned rear brakes fight fade. A vacuum-operated emergency brake automatically releases, when the engine is running, as the car is put in gear. A slip clutch reduces fan speed and cuts down on its noise on the snooty air-conditioned jobs.

Lincoln



WIND splits run almost the full length of the hood. Rubber biscuits shock-mount the bumper guards. Mechanically, the car follows the trend toward simpler carburation and smoother performance at low speed. Front shocks have a "rebound cutoff" that slows the wheels to a cushioned stop without the familiar impact of the conventional rubber rebound bumper.

Chrysler



THE grille is adapted from the "300" series. Tail lights are boomerang-shaped. Windows are bigger. Door latches have two distinctive features—they close silently, and when locked the handles free-wheel. The entire panel is electronically lighted—a transistor oscillator converts battery juice from DC to AC, and this is used to excite phosphors in a special ceramic material.

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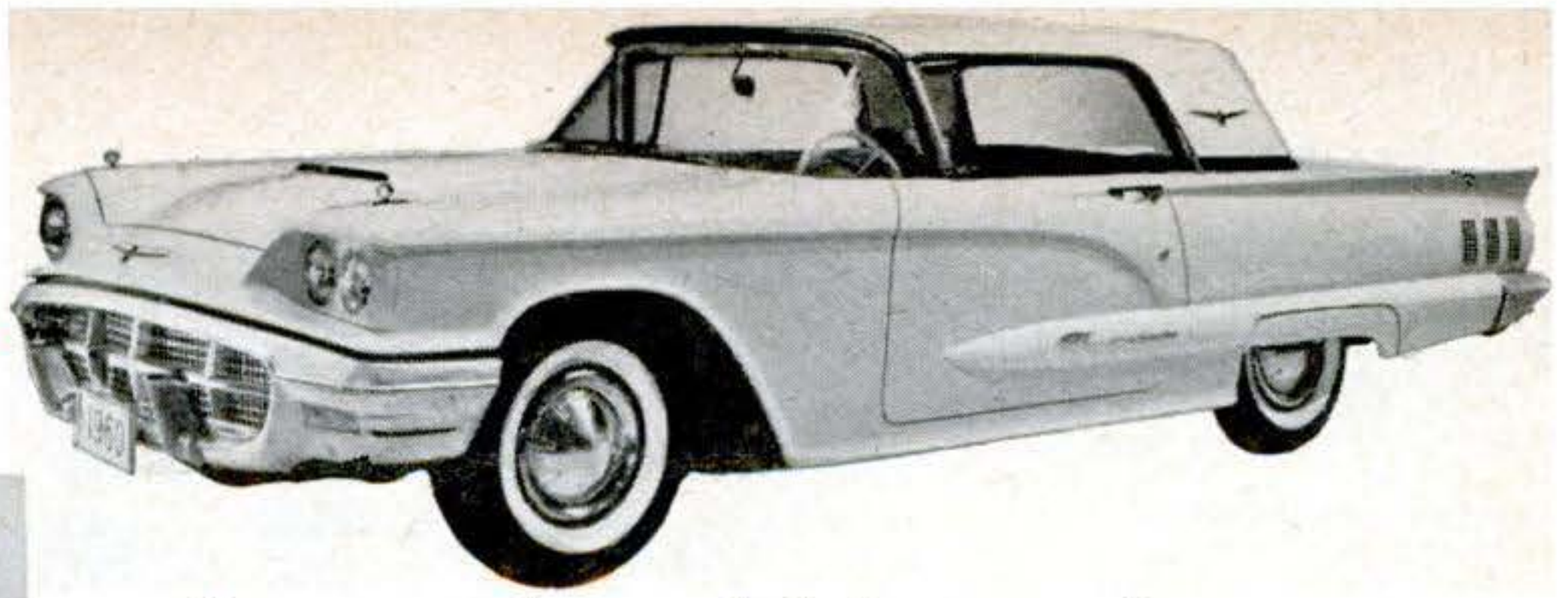
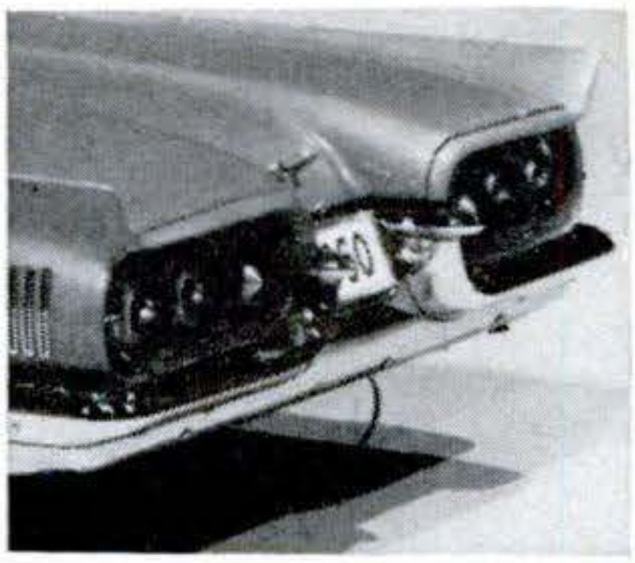
Thunderbird



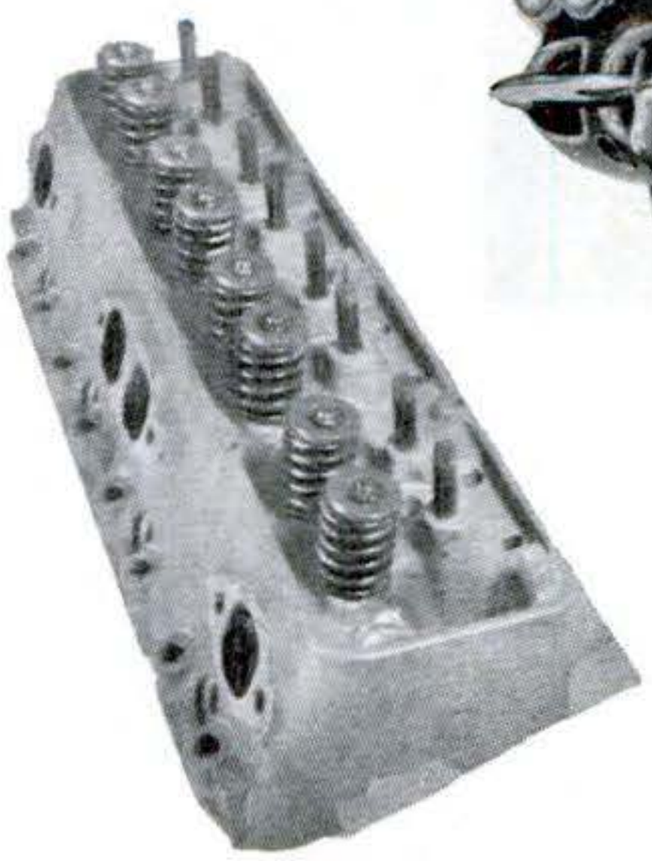


PARTISANS who growled about any changes were premature. The grille has been dressed up a bit, that's all. The handsome stern remains unchanged. Buyers who like a European-style sliding roof can have it at slight extra cost. The convertible deck no longer requires manual locking and unlocking. Just turn a convenient switch and the work is done for you by little motors.

Hawk

TRANSMISSION, clutch, radiator and power are heftier. The V-8 engine is boosted in cubage from 259 to 289 inches and horsepower from 180 to 210. An optional four-barrel carburetor delivers 225 hp. Brake drums are finned. Headrests are optional with split-back seats. For the very well-equipped traveler, the luggage compartment is bigger than last year's.

Corvette



SPORTS-CAR enthusiasts will find some fancy changes in the new Corvette. The optional fuel-injection engine has an aluminum head. The clutch housing is aluminum. So is a new cross-flow radiator. The fuel-injection job, with a competition cam, is up in compression from 10.5:1 to 10.75, the horsepower from 290 to 300. Intake valves are bigger. A rear stabilizer bar gives the car a surprising amount of steadiness in cornering without need for heavy springs and shocks.

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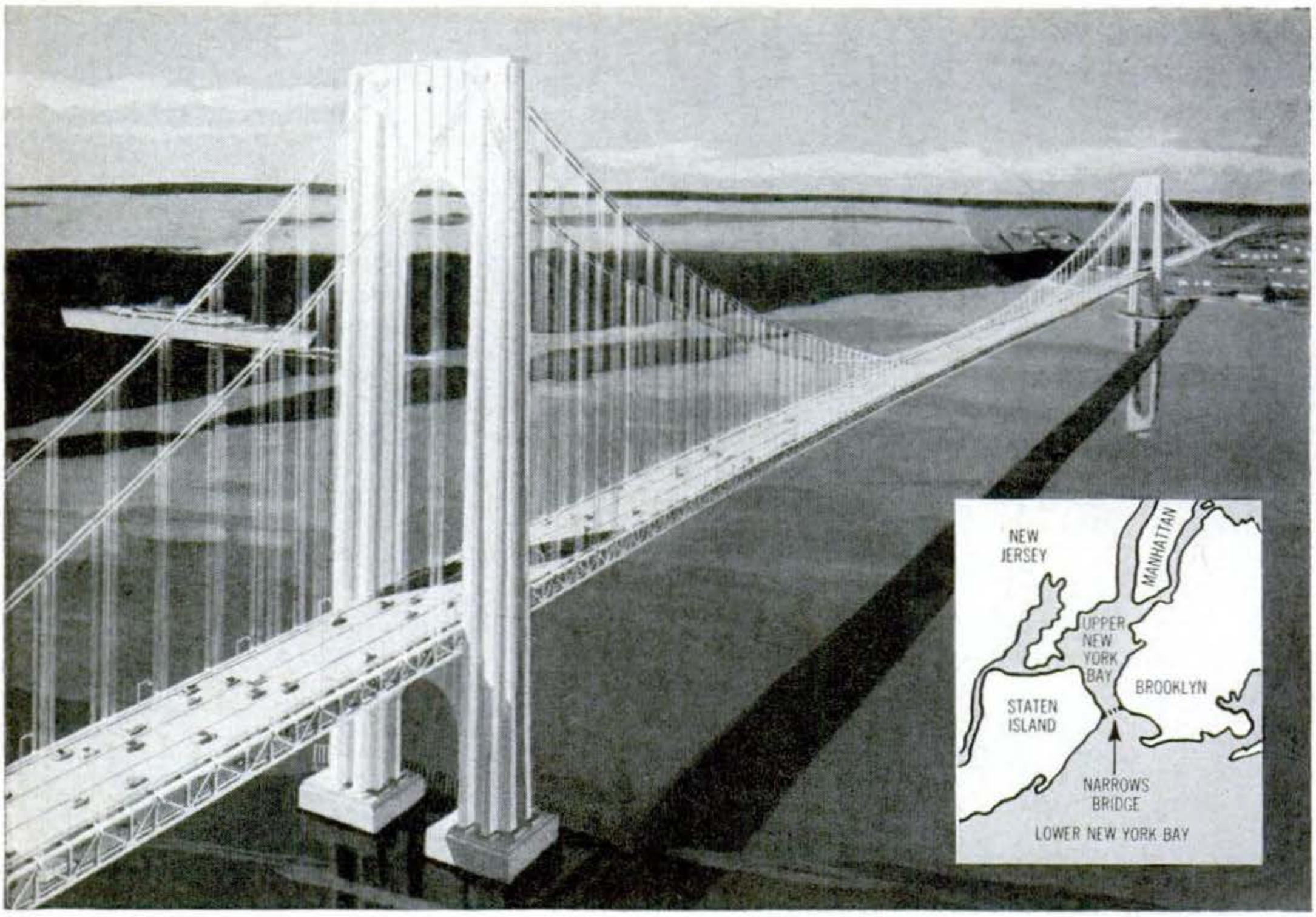
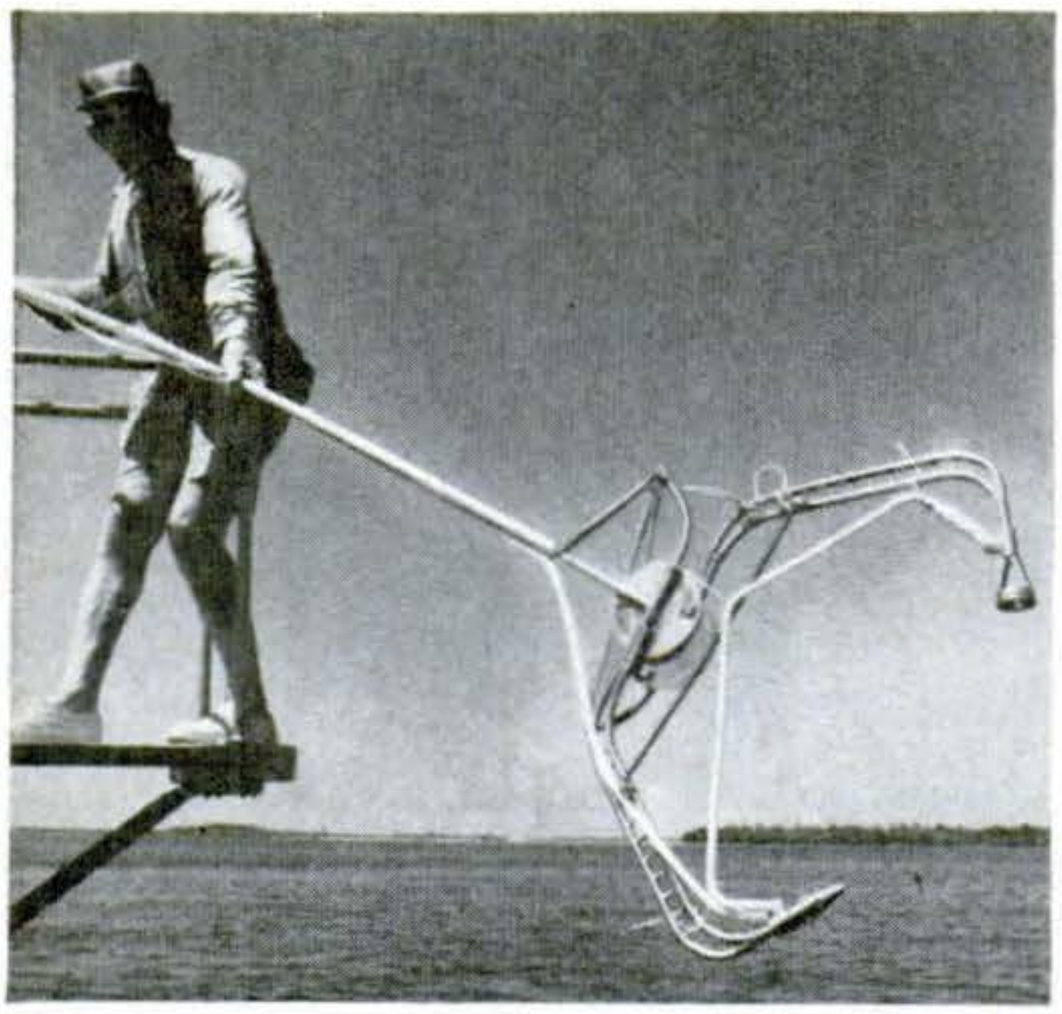


WORLD'S LONGEST SUSPENSION BRIDGE

Hanging high over the Narrows of New York harbor between Upper and Lower Bay, this bridge will link Staten Island to Brooklyn (see map) when completed in 1965. It will be 6,690 feet long, its 4,260-foot center suspension span exceeding that of the Golden Gate Bridge by 60 feet. Estimated cost: $320,000,000.



TAIL GRABBER. The rope frame above catches porpoises for the Miami Seaquarium—by the tail. It hits the fish's back, slides to the tail where it is triggered shut. The frame falls away, and the fish is pulled in by the rope.

RAIL BIKE. Trackwalkers in Northern Rhodesia no longer complain of sore feet. This one rides on his inspection job. The bicycle is equipped with an outrigger to hold it steady and three flanged rollers that keep the tires on one rail.

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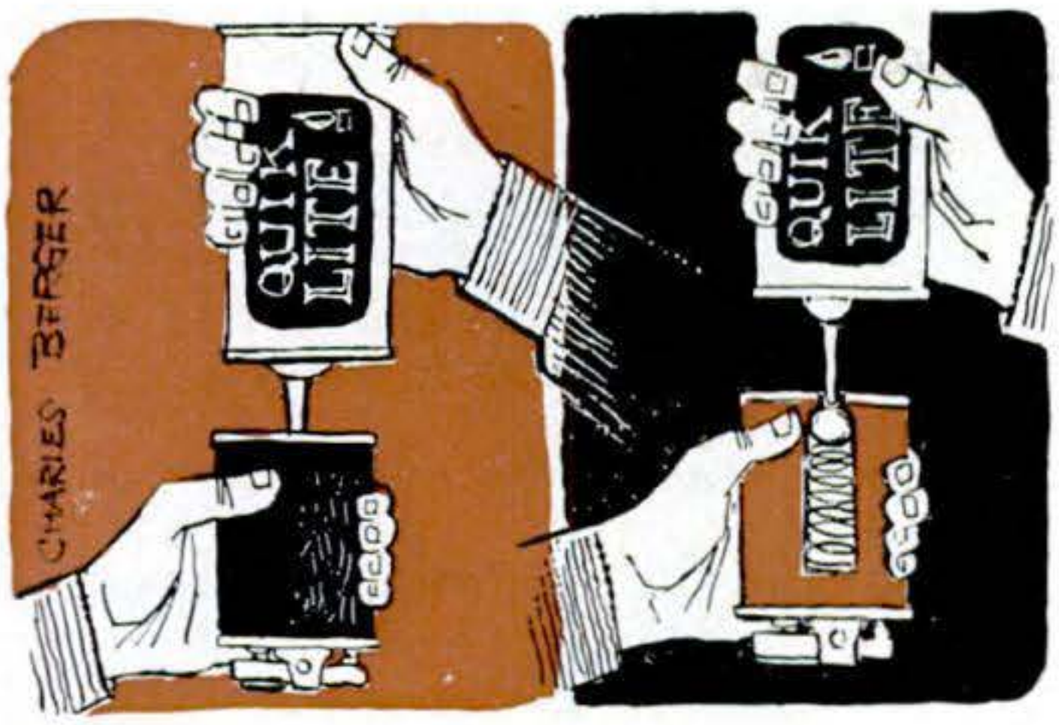
"I'd like to see them make..."

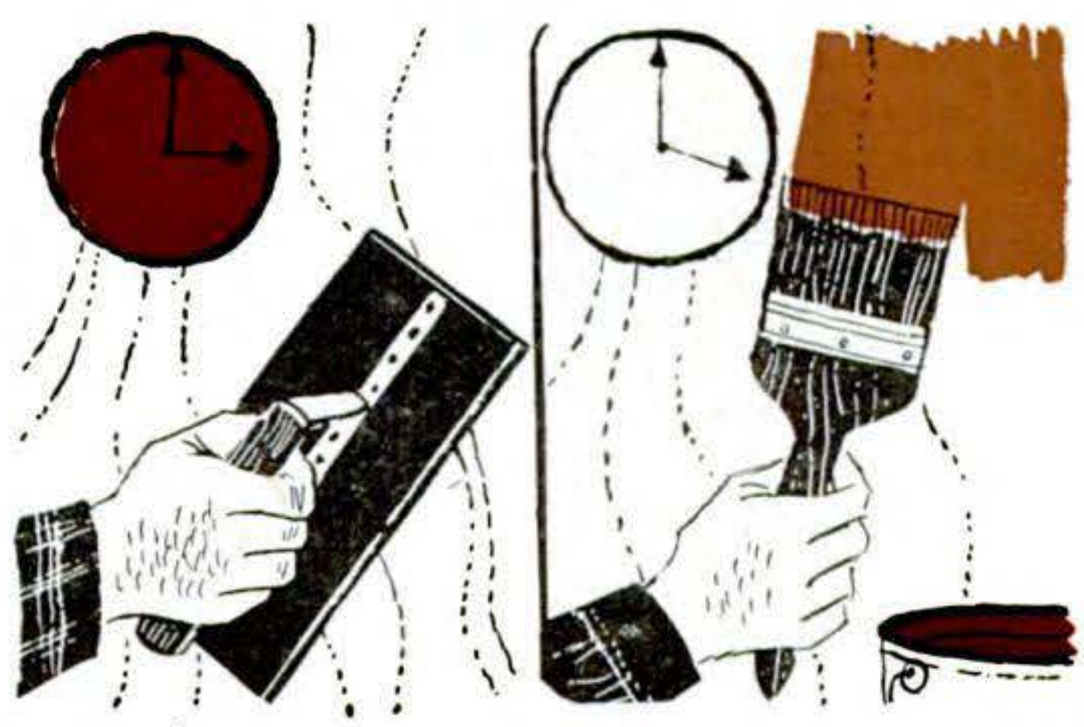


EASY-FILL CIGARETTE LIGHTERS with a spring and check valve in the bottom. Pressure of the fuel-can tip would push aside the ball normally sealing the opening.—*J. Netzel, Tacoma.*

A DUST-MOP CLEANER to eliminate shaking mops outdoors. Why isn't there an attachment that would suck dust right into a vacuum-cleaner bag?—*W. N. Saha, Syracuse.*

A TWIST-DRILL SHARPENER that works like a pencil sharpener. Insert a drill, turn the handle and the tool would be sharpened in a hurry.—*Robert LeBoeuf, Salem, Mass.*

MORE STORAGE IN CARS. A bin in the backrest of the front seat could open into the rear passenger compartment and would use space now wasted.—*L. E. Cottingham, Philadelphia.*



PAINT FOR USE OVER FRESH PLASTER that would speed up decorating of new homes by eliminating the curing period or use of a neutralizing wash.—*J. P. Smith, Chicago.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

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Why We Change When the

MOST of us are aware that somehow or other the weather has a powerful effect on our moods and behavior, on how we feel and how well we work. Now, medical climatologists are pinpointing how and why different kinds of weather make us react in certain ways.

Heat and humidity increase crimes of violence

Data on 40,000 major crimes were correlated with temperature and other weather factors on the specific hour and day of each crime. The conclusions:

Murder, rape and aggravated assault increased by 45 percent on muggy, warm days and nights, when skies were clear and the temperature averaged about 80 degrees. Such crimes of violence also mounted, by about a third, on dreary days when the sky was overcast and the air very humid, though the temperature was only about 70 degrees.

On the other hand, when the weather was seasonably comfortable, the air dry and crisp (and shortly after a period of bad weather) the crime rate went way down to 75 percent below average.

Thus, humidity in the air (short of rain, which clears the streets) emerges as an "accessory" to murder and rape.

"The incidence of crime is not a randomized affair," observes Dr. Frank C. J. McGurk of Villanova University, who directed this project. "There are peaks and valleys in the crime rate that are not accounted for by the day of the week or hour of the day. It looks as though they're caused by an external factor such as the physical environment."

Sudden changes often trigger heart attacks

Studying 250 cases of coronary occlusion, Philadelphia climatologists learned that three out of five attacks happened when a cold front appeared abruptly, as both temperature and barometer dropped sharply.

Similar findings were arrived at by Drs. H. C. Teng and Howard E. Heyer, of Dallas, who reported that most of the heart patients who had an attack during a rapid onset of cold (or warm) weather, were either asleep or resting at the time. Physical exertion, therefore, was not involved. It was the strain of adapting to the *change* of weather that evidently caused the heart attacks.

Good weather doesn't always mean good work

If you think you do your best work on clear, glorious days, you're mistaken. According to Dr. Igho H. Kornblueh of the University of Pennsylvania Graduate Hospital, prolonged blue skies reduce your productivity. After several nice days, a cloudy or rainy day will boost your output.

And contrary to popular notions, you do not work better—physically—during cold weather than on warm days. Of course, you move along livelier in winter to keep warm but actually your body efficiency drops as your energy and combustion levels rise. On mental tasks, however, you achieve more when temperatures drop and air pressure increases.

In other areas of human behavior,

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By Theodore Irwin

Weather Changes

Since March, 1958, members of the American Institute of Medical Climatology, headed by Dr. George M. Piersol, have been working closely with the Philadelphia police department, its medical examiner and other officials on far-reaching research projects. Here's what they've learned so far.

weather also seems to play a significant role. Still in progress is a study by Institute members of self-aggression and suicide. "We think that accident proneness as well as suicide may be affected by the weather," says Dr. Kornblueh. "We also believe that on certain days it's more difficult to keep discipline in military ranks because of the weather."

Besides the Institute's climatologists, scientists elsewhere are steadily adding to our store of knowledge as well as educated conjecture. Says Dr. Rene J. Dubos of the Rockefeller Institute of Medical Research: "More and more examples are being reported of the complex and varied effects of climate on all forms of life, from the virus to man."

Here are additional findings:

Shifts in weather affect all your bodily functions

The immediate effect of any change in the weather shows up in your blood pressure, pulse, body temperature, urine—actually in all the metabolic and chemical processes of the body. Some people adjust satisfactorily, others cannot.

Often, the weather is the straw that breaks the camel's back: People on the verge of being ill surrender to the illness when a sharp weather shift depletes their strength. To many already ill, a violent break in the weather may push them over the brink to death.

By itself, weather rarely brings on a disease. But pronounced drops or rises in temperature, humidity and barometric pressure alter the body functions just enough to throw them off balance.

Consider ulcers, for example. Last year, Dr. Francis K. Davis Jr., a leading member of the Institute of Medical Climatology, completed a study of patients with duodenal ulcer admitted to the Philadelphia General Hospital. He found that the peaks of hemorrhages from ulcers occurred in March-April and October-November at times when there were marked variations in temperature.

As a result, Dr. Davis suggests that for those prone to ulcers, the best place to live is a warm climate with little daily and seasonal shift in temperature.

Many attacks of asthma occur during thunderstorms, when erratic temperatures, winds, barometric pressure and humidity work a strain on our bodies. In stormy regions, points out Dr. Clarence A. Mills of the University of Cincinnati, there is also a wave of "epidemics" of acute appendicitis. "In these areas," he says, "appendicitis becomes a rapidly fulminating disease with quick progress to perforation and spreading peritonitis."

Why surgeons watch the weather

Some obstetricians believe that a complication of childbirth, eclampsia, is often influenced by a sudden weather shift. The conviction that weather is a factor in surgery is particularly pronounced in Germany. In Hamburg, surgeons and meteorologists compared results of thousands of operations—especially cases of postoperative bleeding and embolism—with the prevailing weather at the time. Now, early every morning, a bulletin is

CONTINUED

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issued by the Hamburg Central Bureau of Meteorology. Through these bulletins, surgeons are alerted when it will be unwise to do elective surgery (other than emergency operations) that day.

The weather can make you nervous

Mental stability is also affected by swift weather changes. If you've ever felt jittery before a storm, it's understandable. According to Dr. William F. Peterson of Chicago, a pioneer in climatology, "more potentially psychotic individuals become psychotic during weather conditions resulting in oxygen hunger." That's because the central nervous system is unusually susceptible to changes in oxygen supply and the weather has a lot to do with it.

Psychiatrists at mental institutions have often noticed how patients' behavior parallels certain weather changes. In one case, a 22-year-old patient had six violent episodes in a few months—all of them when the temperature was unusually low. A middle-aged woman became homicidal on three nights in one month—each night one of the coldest of the year.

Liquor hits you harder on hot days

Remember that liquor is more potent in hot weather. A small amount of alcohol is usually burned up instantly in your body. But on a hot July day, the alcohol is so rapidly absorbed by your nervous tissues that it doesn't have the normal chance to be burned up. Two cocktails that ordinarily give you no trouble may make you tipsy on a very hot day.

Blame your moods on the barometer

You've probably experienced a morning when you've wakened in a foul mood, cut yourself while shaving, ripped a button off your shirt and growled at your family. If you checked the weather report that morning, chances are there was a drop in the barometer. That means a lower pressure exerted by weight of the atmosphere on the earth's surface—and on you. Usually it's before a storm, when the winds are starting to blow up and the temperature is shifting.

More people are restless and irritable, have migraine headaches and insomnia, faint and feel depressed on days when there's a decided drop in the barometer. A psychology professor at the University of Illinois found that on these low-pressure days children are most apt to get troublesome and convicts break more rules than usual.

So, when you leave home in the morning and notice there's been a deep fall in the barometer, be prepared for an "off day." Don't overexert yourself, drive with unusual caution, and don't let a foul mood control important decisions.

What Have Ions Got to Do with It?

SOME scientists here and abroad maintain they've discovered why changing weather can influence your health and behavior. The mysterious ingredient: electrical charges in the air called ions.

These scientists are convinced that:

- Positive ions can make your mind and body function considerably below par.
- Negative ions will undo the damage, even make you feel better than before.

How do ions get into the weather-and-health picture? There are always ions in the air and normally they don't bother us, although over half of them are positive. But, say ion theorists, when this near-balance is upset by inclement weather, sensitive persons are affected.

When the barometric pressure drops, air rushes in to fill the partial vacuum created. This air, descending from jet-stream regions or sucked upward from pores in the sandy earth, is likely to import large quantities of positive ions which create your discomfort. Negative ions, produced by cosmic radiation and ultra-violet-treated layers higher up in the atmosphere, give you that invigorated feeling after a thunderstorm.

Use of negative ions in various devices for treating many ailments is common in Soviet Russia, but only three U. S. hospitals are using them. They are being tried, experimentally, particularly for air-borne allergies such as hay fever. Some air-conditioner makers are getting into the act, too. Doctors, generally skeptical, are cautious about interpreting results.

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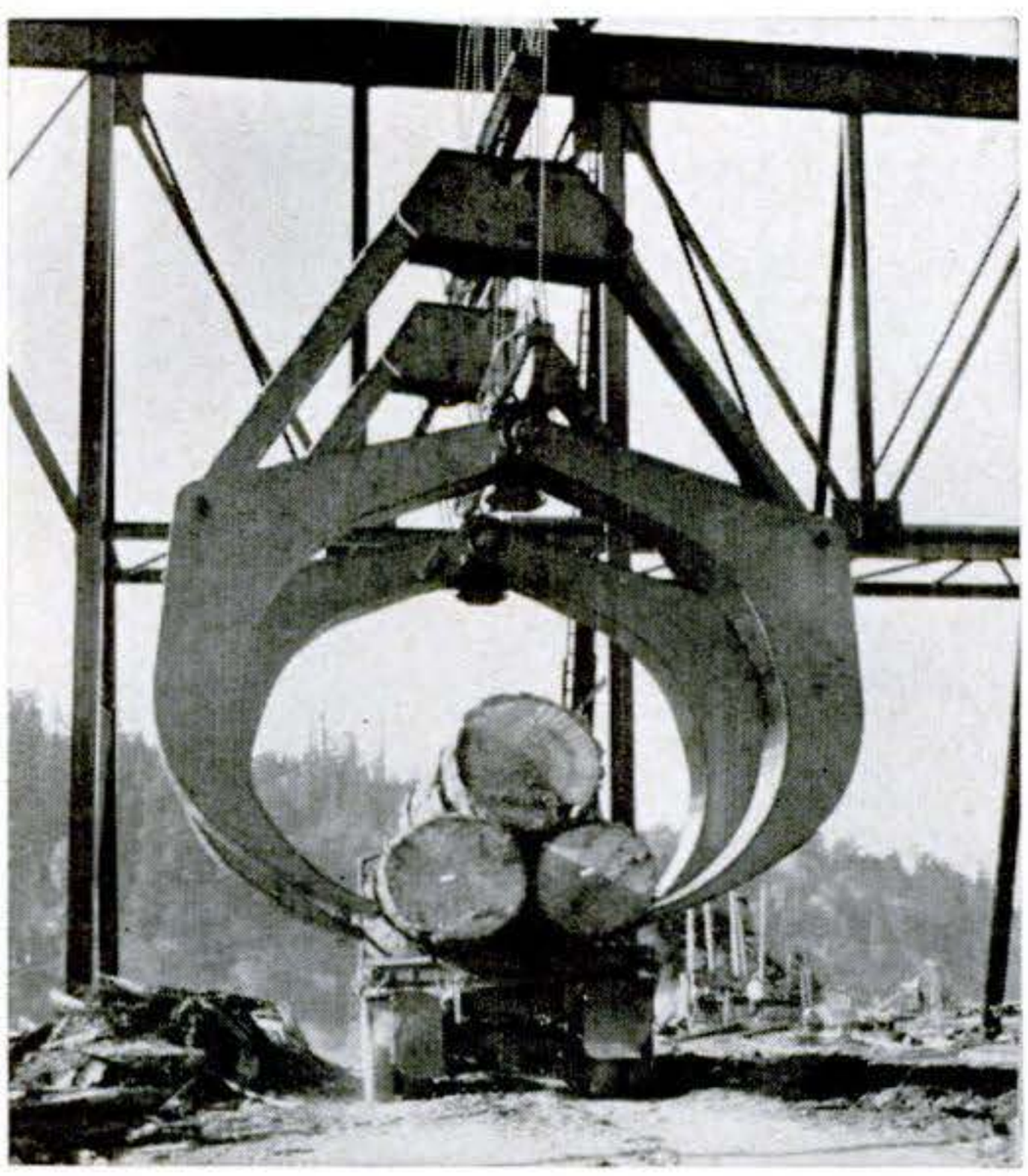
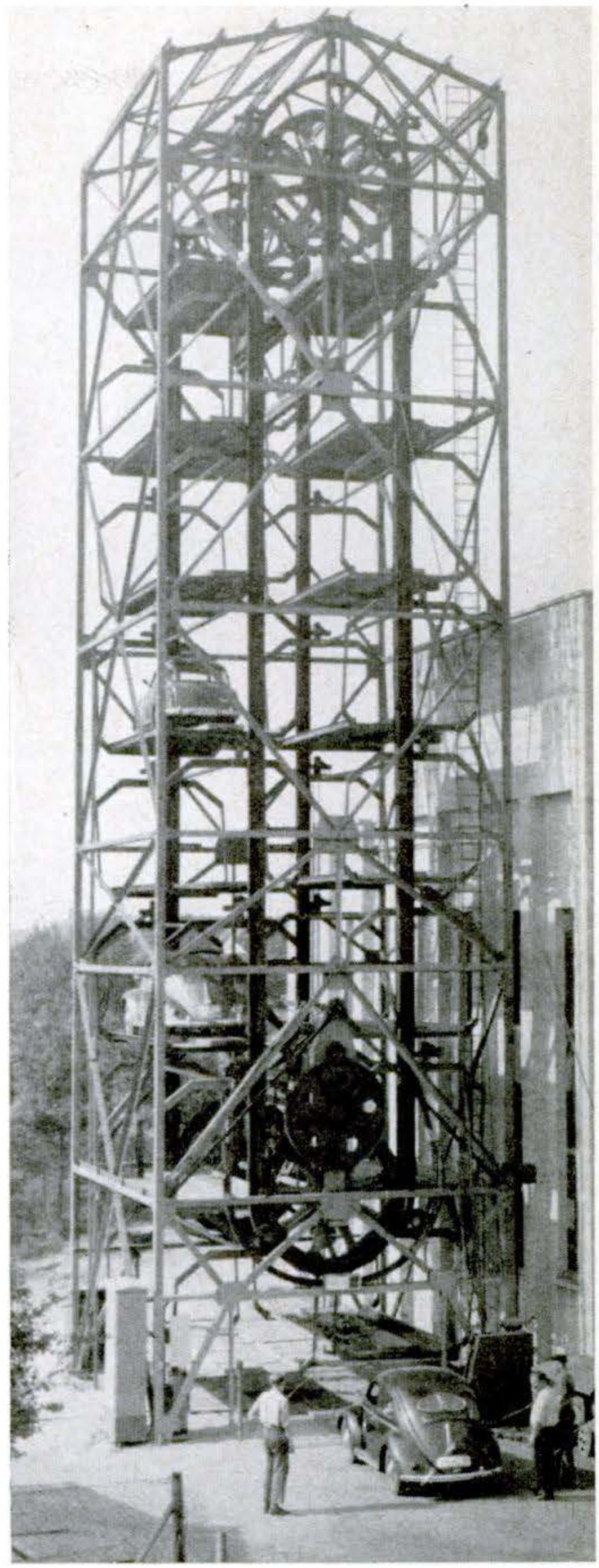
CAMERA EYE. This hangar door at Love Field, Dallas, shuts to within three feet of a plane's fuselage. Then four rubber-edged steel plates slide in—like a camera shutter—for a weathertight seal. Tails need little maintenance. The system is economical, saves space.



BIG BITE. The big jaws of the machine above unload a lumber truck or flatcar in one bite. The giant log unloader is used by the Pacific Lumber Co. at its Scotia, Cal., works. It clamps on a stack of timber and scoops it up. Then it moves on overhead rails to the sorting yards.



FERRIS-WHEEL PARKING. Here is a new way to park automobiles in tight space. A department store in Cologne, Germany, put up the equipment. It can park 20 cars on ground a half-dozen would crowd. Cars ride onto the lowest platform, are pulled up by a conveyor belt.

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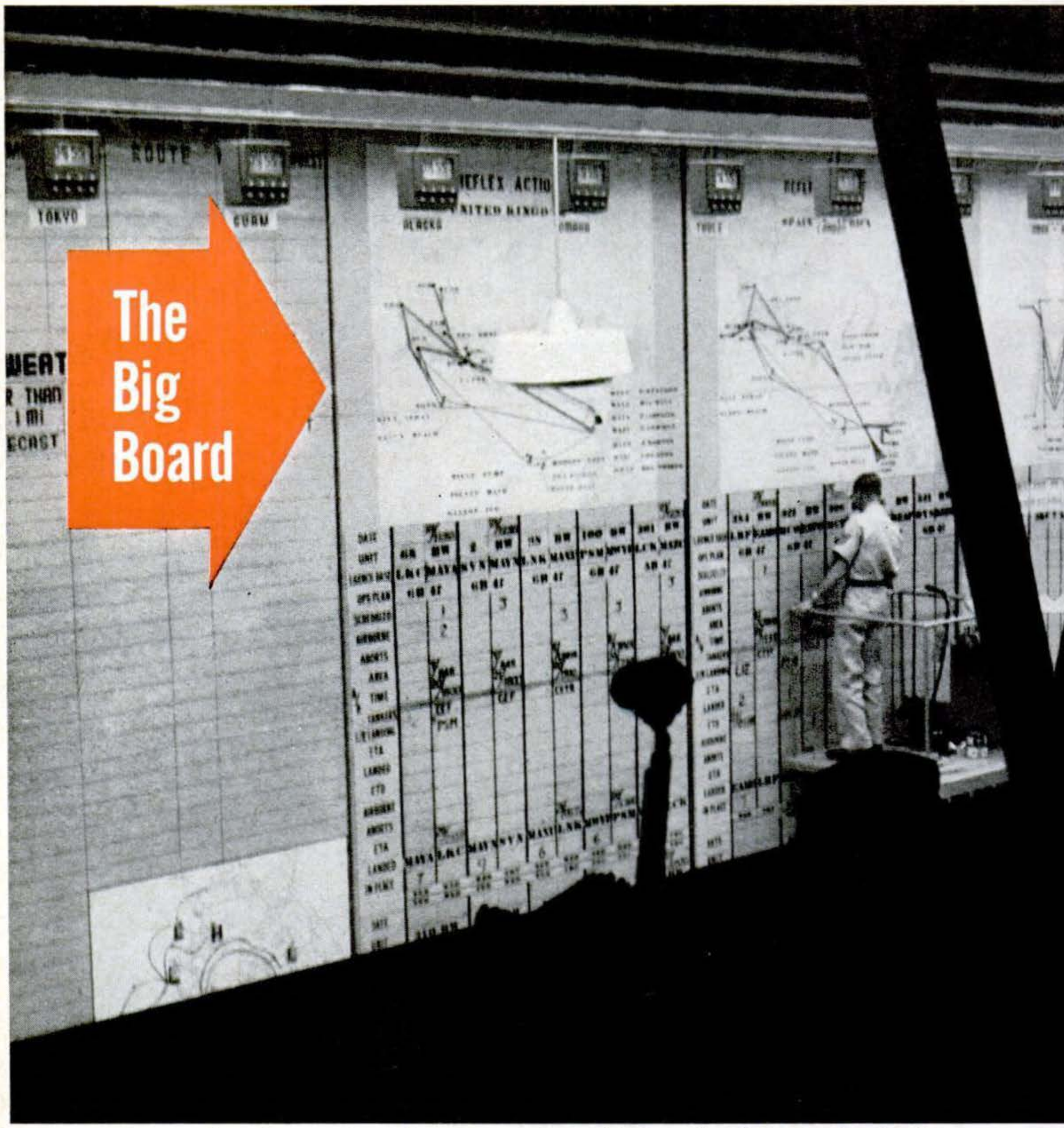
The Deadliest in the



BATTLE PROGRESS of an intercontinental war would be posted, second by second, on these huge display panels in the underground global control center of the Strategic Air Command. To fight such a war, the officer shown in silhouette has at his fingertips *right now* the deadliest arsenal of nuclear power, jet bombers and long-range missiles in the free world. To get them into action he has only to pick up the famous red phone (far right). This, the "hottest phone

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Room World

A visit to the buried vault that protects the brains and buttons behind our global air force

By Frank Harvey

THE U. S. nerve center for intercontinental bombardment—SAC's global command post at Offutt Air Force Base, near Omaha, Neb.—had the gay air of a resort hotel as the staff car swept around the curve that sunny afternoon. In the foreground was a large pool in which hundreds of SAC men, women and children splashed happily.

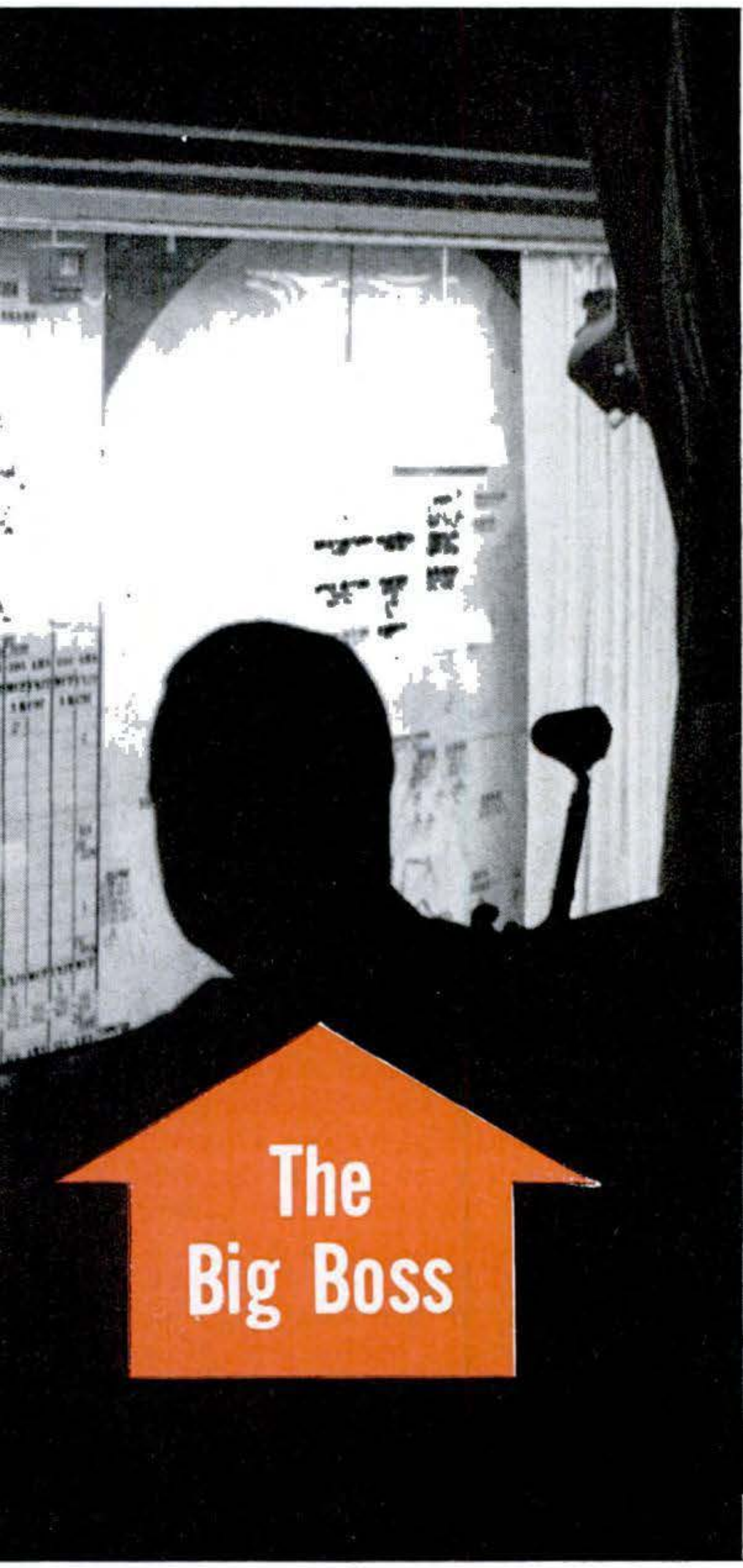
"Doesn't look very warlike," I said to the airman driver.

He pointed to a sign: a mailed fist clutching an olive branch and several jagged lightning bolts, plus the words: *Peace Is Our Profession!*

"Don't let that slogan fool you," the airman said. "We don't want to fight—but if we have to—brother, we sure can do it. There'll be a big Atlas ICBM site around here real soon. If anybody attacks us, all we do is press a button—wait half an hour—and blooooey!"

"But the other guys," I said. "Can't they press a button, too?"

"That's why we've got our command post buried underground," the driver said.



The Big Boss

The Hot Phone

in the world," puts him in immediate communication with every far-flung SAC stronghold. At his command U. S. B-52 and B-47 bombers could be roaring down 70 runways scattered around the world in a matter of minutes.

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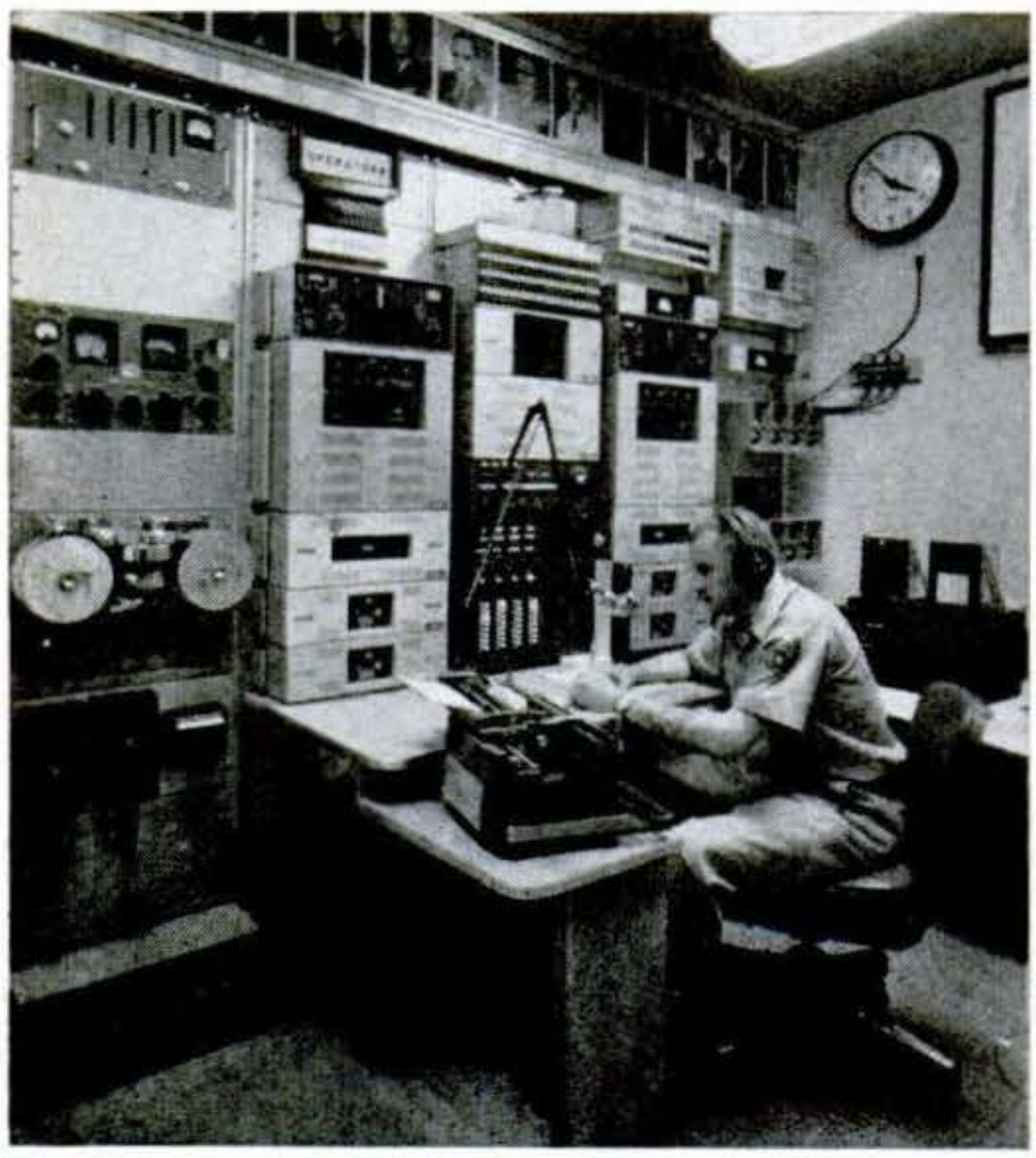
"I hear she'll take a direct hit with an H-bomb and still be in business."

Later, making a tour of the underground installation, I felt that the airman was being a little optimistic (the H-bomb at Eniwetok dug a crater 17 stories deep). But it would sure take a bull's-eye to do the job. And a direct hit by an ICBM fired 6,000 or more miles away may be on the order of impossible.

"HOW about sabotage?" I asked Captain Ed Derryberry, my guide for the tour. "Suppose somebody sneaked in here with a bomb and blew up the joint?"

Ed grinned. "Right now," he said, "you're on television. You're being watched by guys whose job is to see that nobody gets in here with a firecracker—much less a bomb!"

I looked up, and, sure enough, a camera was peering at me from behind two floodlights. "For the sake of argument," Derryberry went on, "suppose some saboteur actually succeeded in wrecking this command post at the zero minute—just when reports of a big raid started coming in. It would hurt—but it wouldn't be a body blow. We'd simply switch to another command post set up to do the same job—and if that one went out—we'd switch to a third. SAC never was in favor of carrying important eggs in one basket."



SINGLE-SIDEBAND RADIO in this small room took me on a voice trip to SAC bases around the world—with stops at Guam, Saudi Arabia, Spain and the Azores—in 20 seconds.

"I guess everybody who works here is cleared for Top Secret."

Derryberry laughed. "Listen," he said. "We've got jobs down here so touchy we don't allow a mere Top Secret clearance in the same part of the building!"

He demonstrated the cloak-and-dagger nature of the place by pausing in front of Weather Headquarters, which at most bases is about as secret as an old comic book. The steel door was locked. Derryberry knocked and a panel opened and an eye peered out through a peephole. "Business?" a voice asked curtly.

Derryberry told him. There was a delay, then the clicking of a lock, and we were permitted to take a fast supervised look at weather maps that showed (as of right then) how much cloud cover they had at Fairbanks, the winds aloft over Greenland, and several thousand other details of vital importance to an SAC bomber headed out.

Much of the underground pillbox at Omaha is devoted to machines. In a single-sideband radio shack, two sharp sergeants gave me a quickie demonstration. They got a reply from Guam in six seconds. They tried Eielson Air Force Base in Alaska, couldn't raise it in five seconds—so "patched through" March Field, Cal., and got Eielson in 10 seconds.

THEY tell a story about the general who tried to call his office from the single-sideband radio in his car while on the way to a golf game. Local disturbances prevented the call from going through. So he called Torrejon, Spain, and they patched him back to Omaha. Ten seconds later he was talking to his office. "Left my clubs behind the filing cabinet," said the general. "Send them out to the course, will you?"

The command post is never shown to visitors when in "combat configuration"—with war-plan panels rolled out into view. When Derryberry and I walked through, the floor-to-ceiling drapes concealed everything except routine weather data and nonclassified plane movements.

He showed me the famous red tele-

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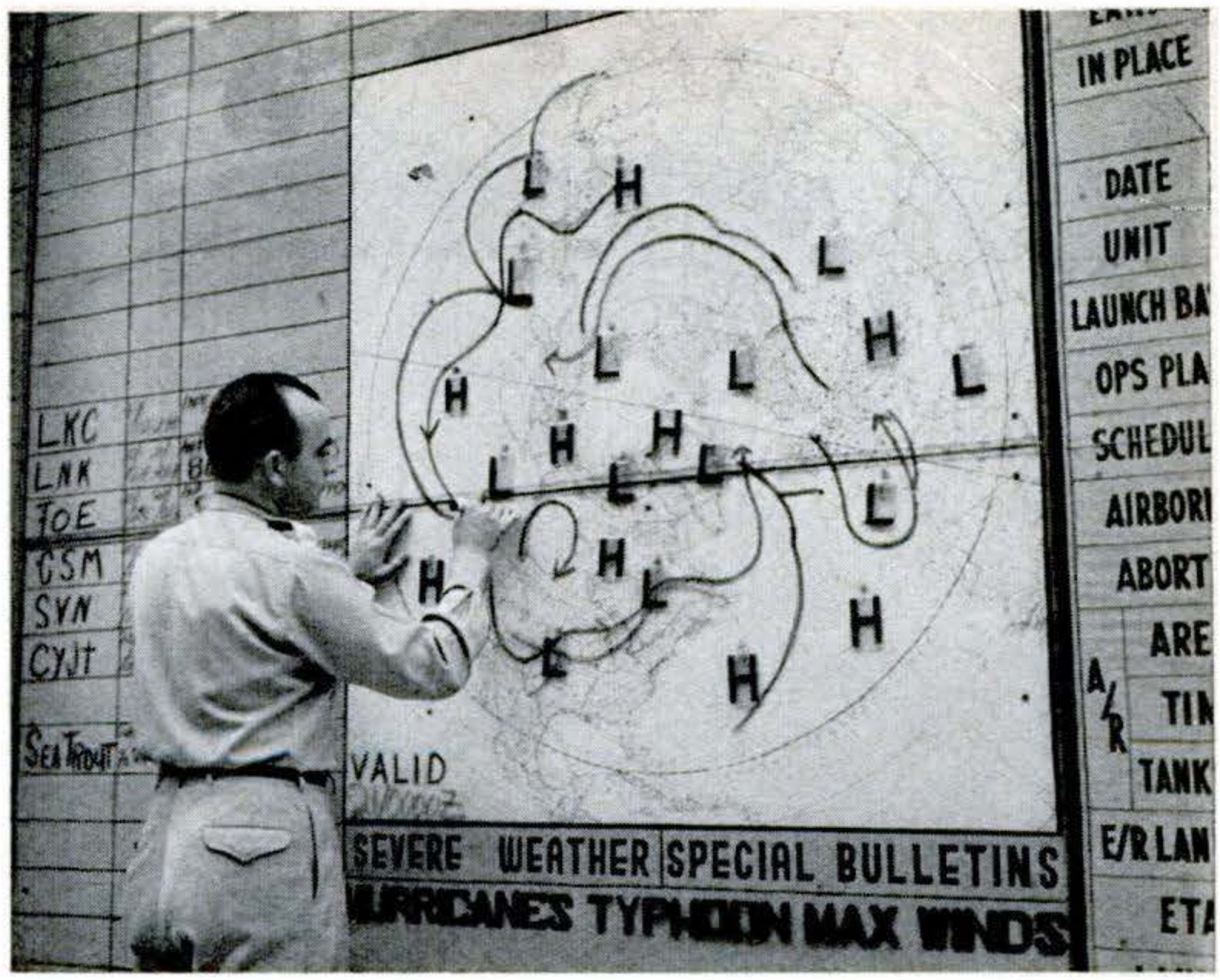

WEATHER ON TAP for H-bombers. Reports are gathered around the clock from stations all over the world. Fed into the Omaha grotto by radio and teletype, they are plotted on maps—evaluated into forecasts—pumped out twice daily to all SAC bombers in the air. If the whistle blew, no last-minute weather briefing would be necessary. The commander of each plane already would know the current forecast over the route to his designated target.

phone that connects instantly with every U. S. bomber base all over the world. The red phone had another red-phone backup, plus 60 separate "hot lines," plus SOCS (Strategic Operational Command System, a *private* world-wide telephone net), plus single-sideband radio, plus conventional communication radio. It seems impossible that there could ever be a serious breakdown in global communications between Gen. Thomas S. Power, SAC commander, and his bombers.

One of the biggest and most ominous machines is a special IBM 704 computer. It fills a whole room with its electronics, and can boil down a massive jumble of information into crisp, orderly answers in slices of a second.

SAC's controllers are far from helpless against an attack. By flipping a single switch they can in seconds seal off the underground stronghold with 1,500-pound steel doors. Something called "The Snifter" would tell them how close H-bombs are falling and the intensity of radiation from fall-out. A board full of red and green lights tells which doors are open, throughout the complex. A tricky little alarm system goes off when curious fingers get to fumbling with doorknobs they shouldn't. The War Room is, of course, supplied with filtered air; and there are heat, light, water, power, food to conduct a 30-day war underground without once unlocking those massive doors. There are clocks that tell the time in Tokyo, Guam, Alaska, Omaha, Thule, London, and Moscow.

"ONE thing worries me," I said to Captain Derryberry. "Suppose you scrambled your H-bombers on a red alert. And then suppose the alert turned out to be a phony—and you couldn't get through to the boys by radio, and they went on their way?"

"Couldn't happen," Derryberry said. "Our bombers automatically turn back—well outside enemy defenses—unless we specifically call them and order them to continue."

"Suppose General Power is off in Washington?"

"General Griswold, his deputy commander, would run the show—and if he were gone, we have half a dozen other top-flight officers checked out in the War Room."

"How does an officer 'check out'?"

"Just the way you do in a plane—by running the thing over and over for months and years until you can do it automatically—even under pressure."

Above ground again, my tour over, the women and kids were still splashing in the turquoise pool. I thought of the hundreds of highly disciplined men, and the millions of dollars' worth of glistening machinery, that were on guard below to keep them—and us—safe.

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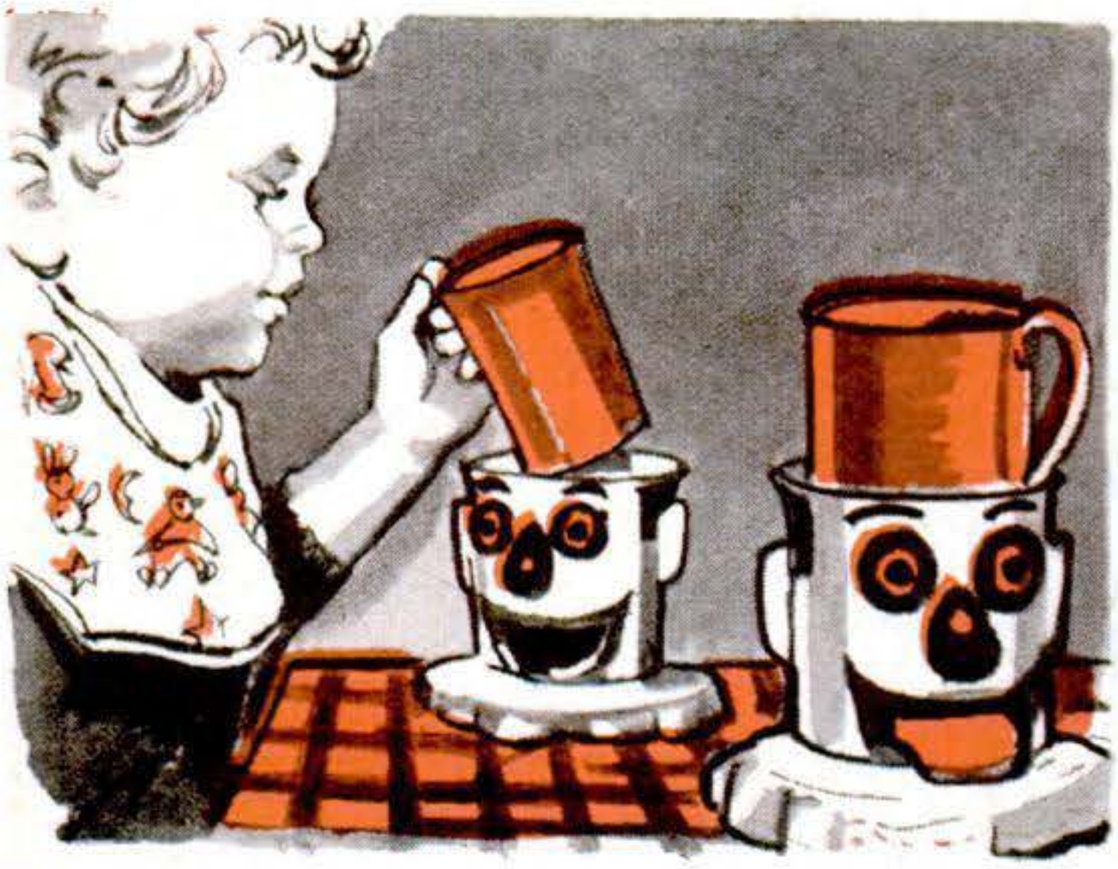
New Ideas from the Inventors

Auger Prop Cuts Ice or Water. With two auger-type rotors to propel it, this recently patented boat would cut through weed-filled water, or skim over ice and snow covering a lake. Inverted troughs on opposite sides of the keel partly enclose the rotors, stabilize the boat in water, and double as sled runners.

Cup Holder Is Two-Faced. A clown face on this tip-proof cup holder would register an approving smile when a child lifted his milk mug, then change expression when he put it back. The tongue, on pivots, would stick out when the cup was seated, retract when it was lifted.

Punch Opens and Vents Can. In one operation, this two-pronged opener would punch both spout and vent in any standard beverage can. A hooked tip, shaped to engage the bead of a can, would form a fulcrum for the two beveled cutters bridged across the lever arm.



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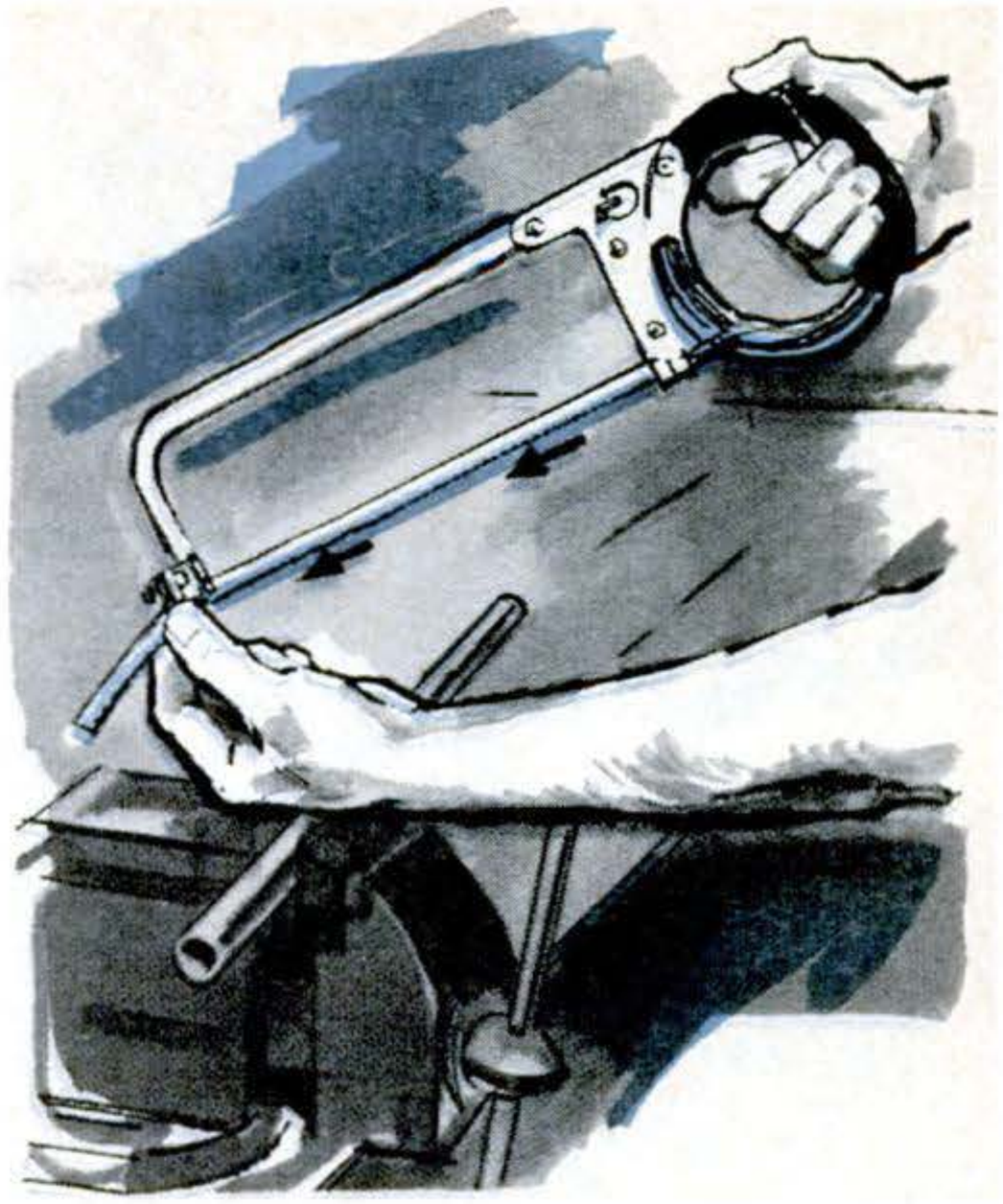
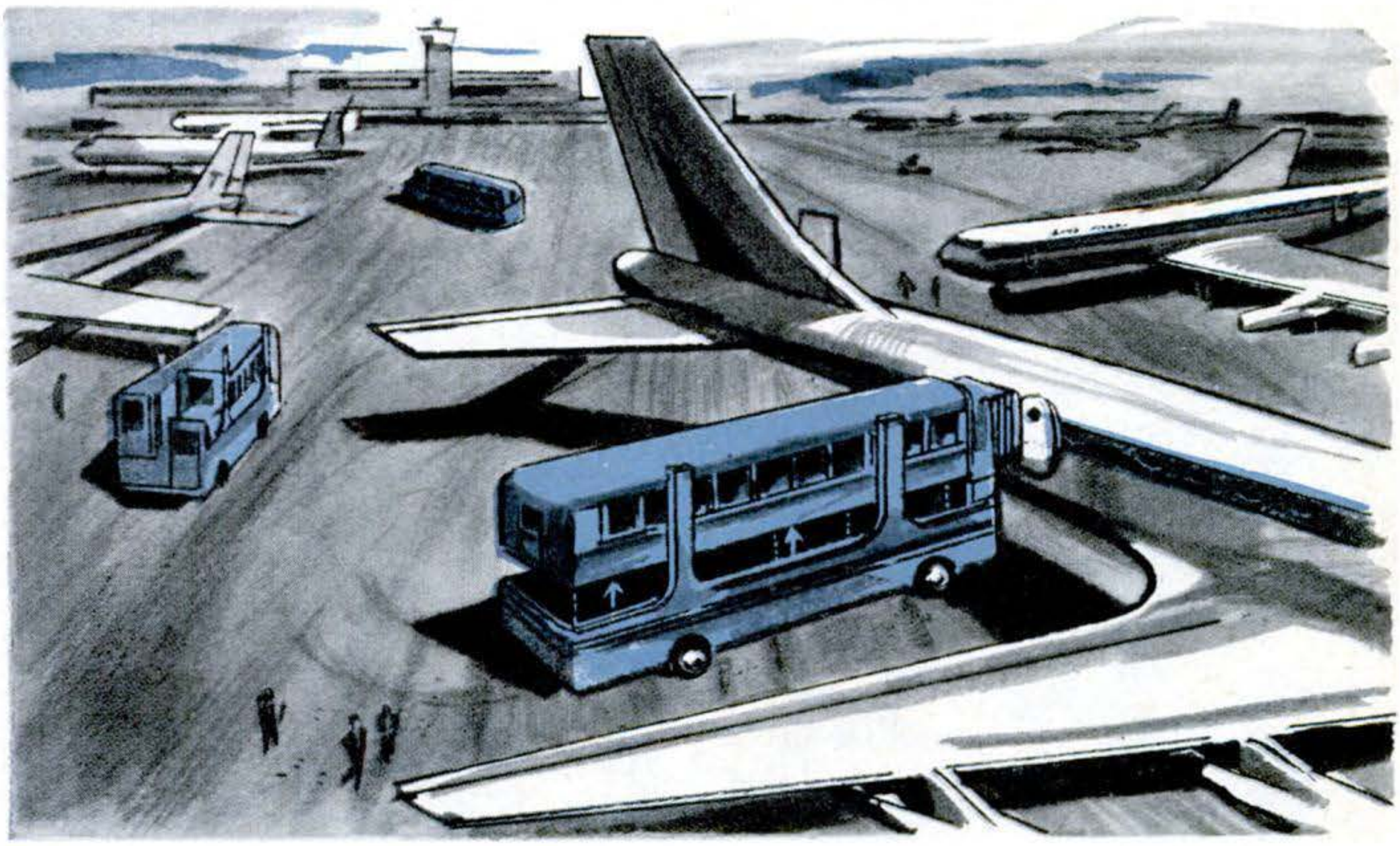
Cap Strip Speeds Battery Check. Instead of unscrewing six individual cell caps to service a battery or inspect fluid level, you'd just unhook one end of this spring-metal strip. Rehooking the strip would tightly reseal each cell under its acid-resistant plastic cap.



Hacksaw Handle Feeds Blades. To replace a worn or broken blade in this hacksaw, you'd just draw a new section from the continuous blade coiled in the handle. Since blade changes often require less than full-blade lengths, loading should be economical as well as quick.

Lift Bus Loads Plane. An elevator would raise the entire passenger compartment of this airport bus to plane-door height so passengers could step directly from plane to bus, or vice versa. On-the-field loading, it is claimed, would reduce plane taxiing time, cut airport congestion, and save travelers many steps.



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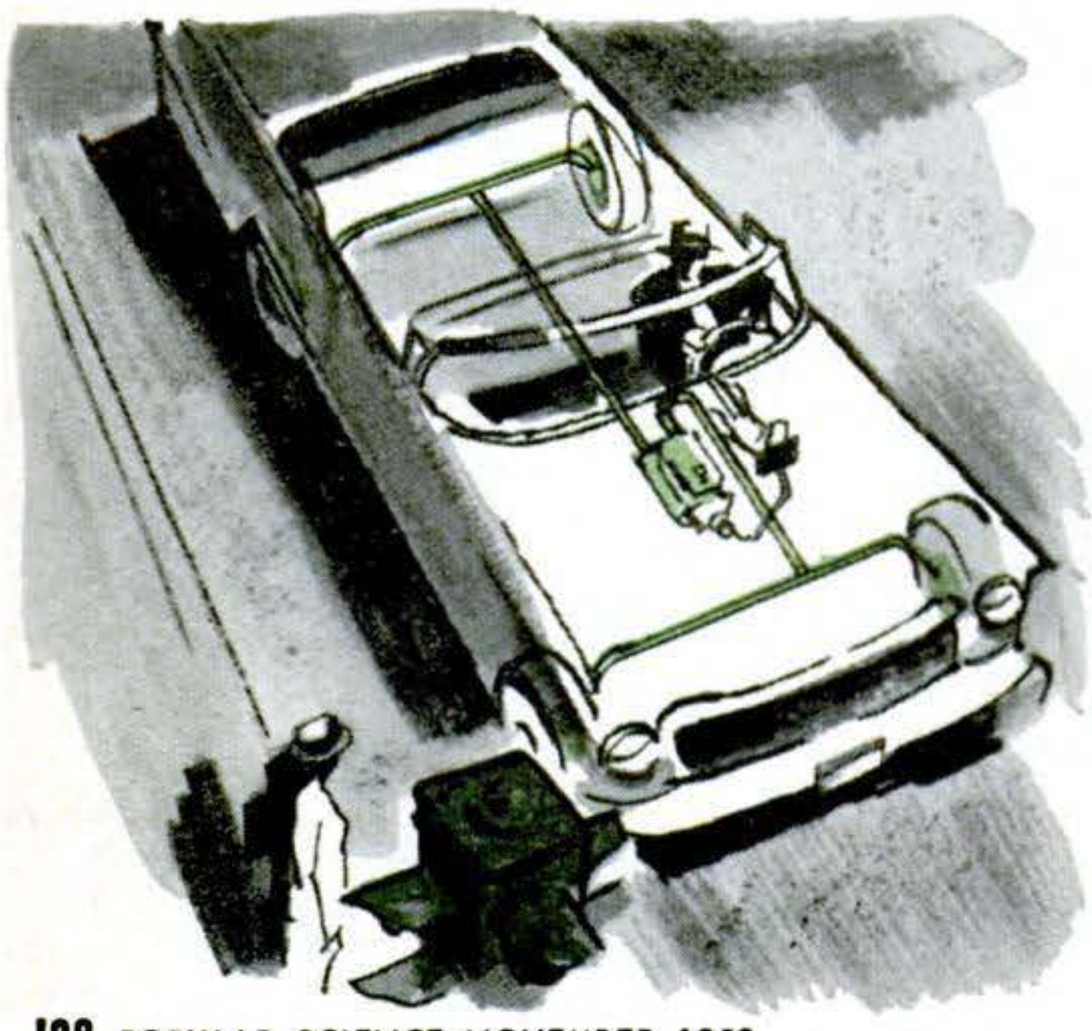
More Inventors' Ideas

Toenail Guide Tightens Joint. A claw on this floor-laying tool would automatically tighten each tongue-in-groove strip against its mate as you toenailed it into place. You'd drop a headless nail into the guide channel, then drive—and sink—it by hammering a follower punch.

Double Brakes Double Safety. With separate master cylinders serving a car's front and rear brakes, you'd have a safe stopping reserve if a line should spring a leak or if either system ran short of fluid. A pivoted bar between the pedal and cylinder pistons would normally equalize their pressure but let either cylinder function if the other failed.



Clamp Locks Ladder to Pole. You could climb trees or poles with greater safety if your ladder had an attachment like this to secure—and center—the top rung. A pulley and cable would let you tighten and lock the clamp jaws from below; unhooking the cable chain would allow the jaws to slide apart.

The following patents have been issued on these inventions: **Boat**—*No. 2,764,117 to J. L. DePersia, Chicago;* **Cup Holder**—*No. 2,828,580 to W. J. Seme, Cleveland;* **Punch**—*No. 2,775,814 to C. R. Klok, Iron River, Mich.;* **Cap Strip**—*No. 2,881,239 to R. Fingerhut, Brooklyn;* **Saw**—*No. 2,767,751 to J. E. Sjoblom, Ornskoldsvik, Sweden;* **Bus**—*No. 2,778,674 to A. C. Attendu, Montreal;* **Nail Guide**—*No. 2,774,969 to C. R. Samples, Akron;* **Brakes**—*No. 2,857,584 to L. D. Gibson, Baxter Springs, Kan.;* **Ladder Clamp**—*No. 2,778,556 to W. P. Johnson, LaVerne, Cal.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

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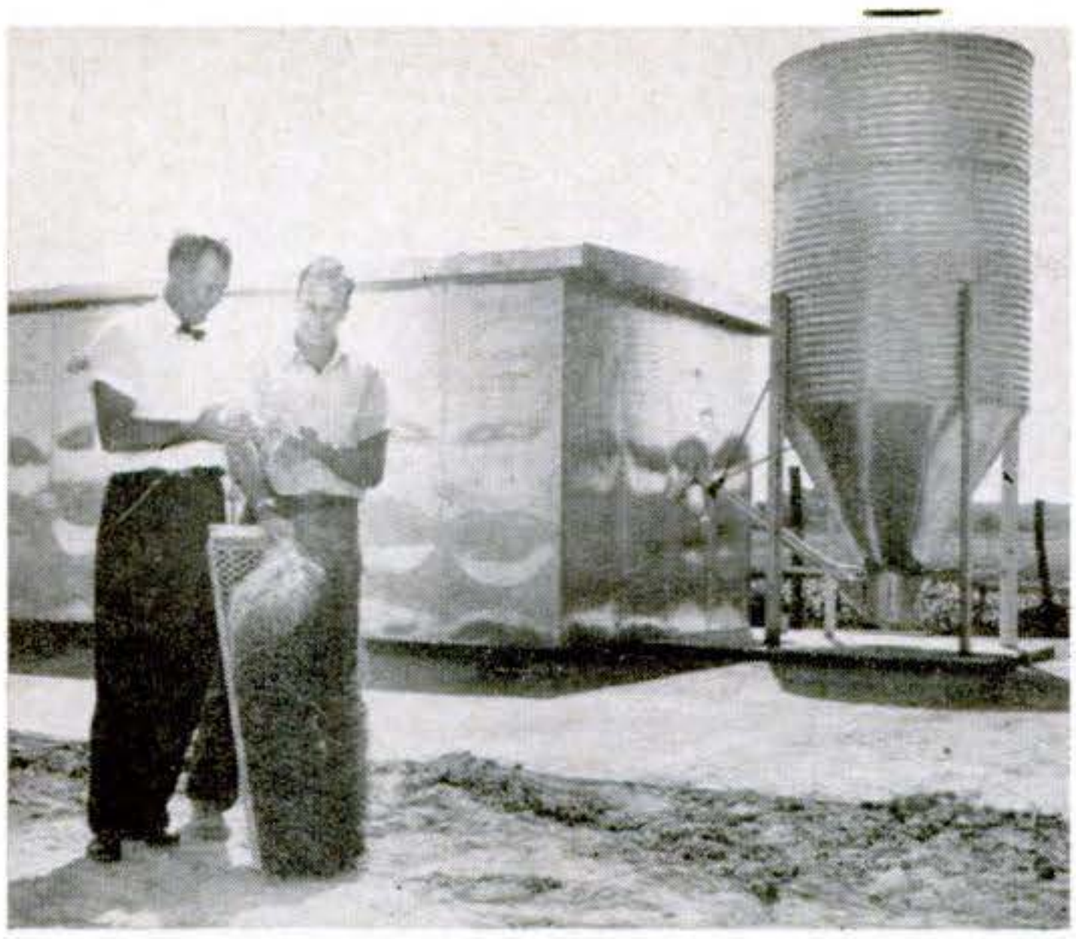


Growing building linked to irrigation tank.

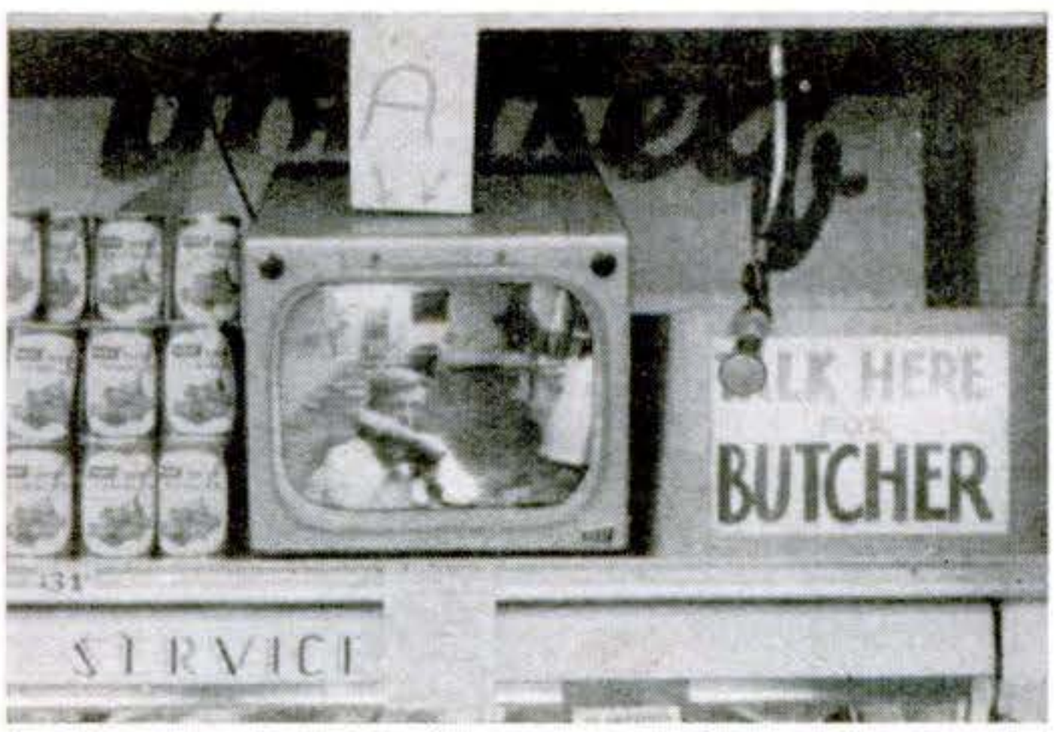
Cows and other animals thrive on the feed.

Trays placed in racks after daily watering.

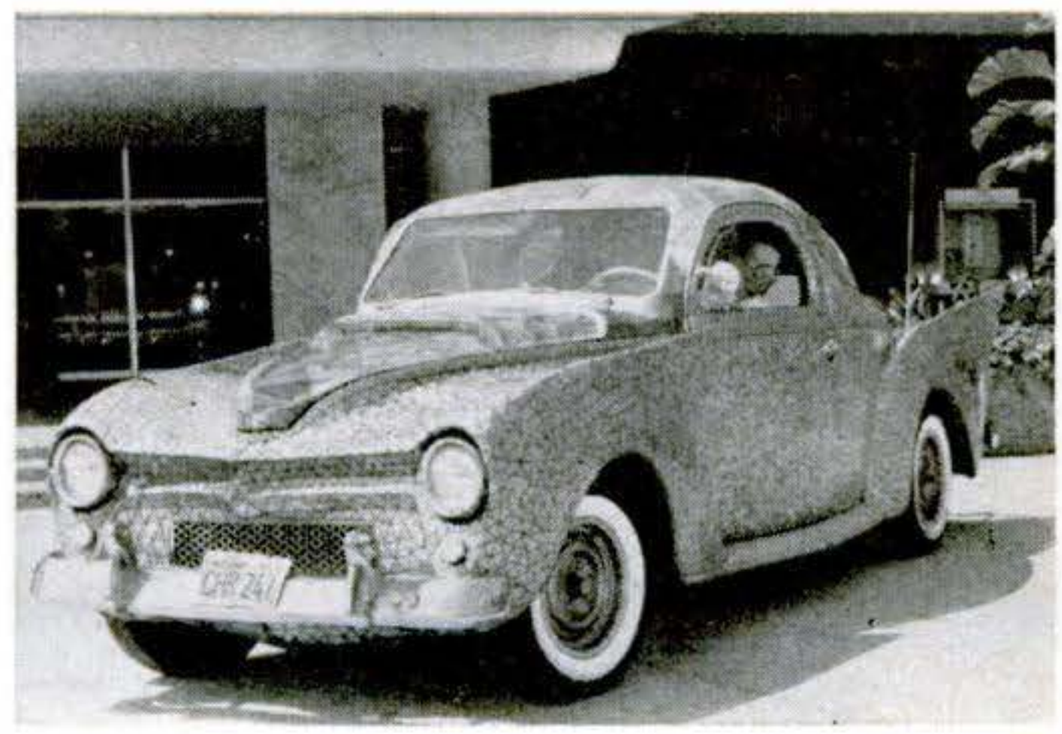
HE GROWS FRESH GRASS EVERY DAY

Here's a plant that produces green grass for farm stock all year round. The feed is grown in trays irrigated by a chemical food in water. The cycle takes six days, after which the fully grown grass is fed to stock and the trays are reseeded. The unit, called Green Feeds, is made by Hydroponics, Inc., of Indianapolis.

MEAT ON TV. Order meat in this supermarket, and you can watch a butcher cut it on television. The Trading Port in Albany, N. Y., uses a closed-circuit camera connected to a receiver out in the store. Orders are given over a mike.



MOBILE MOSAIC. Niklos Bel-Jon is a San Francisco artist. When he acquired the 1938 car below, he replaced the hood and top with fiberglass, added fins. Then he got arty, finished it with aluminum mosaic pieces inlaid with mastic.



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New Oil Burners: Smaller, Hotter,

The completely oil-powered house may be closer than you think. New developments promise cheaper energy from oil

By David X. Manners

STARTLING new developments in home oil-burning equipment may revolutionize the way you power your house. From the labs come reports that oil will soon be doing more jobs, doing them as well or better than gas or electricity, and doing them cheaper.

Here are some of the goodies the oil industry is bragging about:

- A burner with an invisible flame. It needs no chimney, and is so small you can carry it under your arm.
- A hot-air system with a furnace like a jet engine. It distributes heat through ducts only two inches in diameter.
- A more conventional furnace, also chimneyless, that is said to use a third less fuel than an ordinary burner.
- A burner for your present furnace that eliminates noisy flame pulsation.
- Water heaters that work up to 4½ times as fast as gas, 8½ times as fast as electricity, and are cheaper to run.

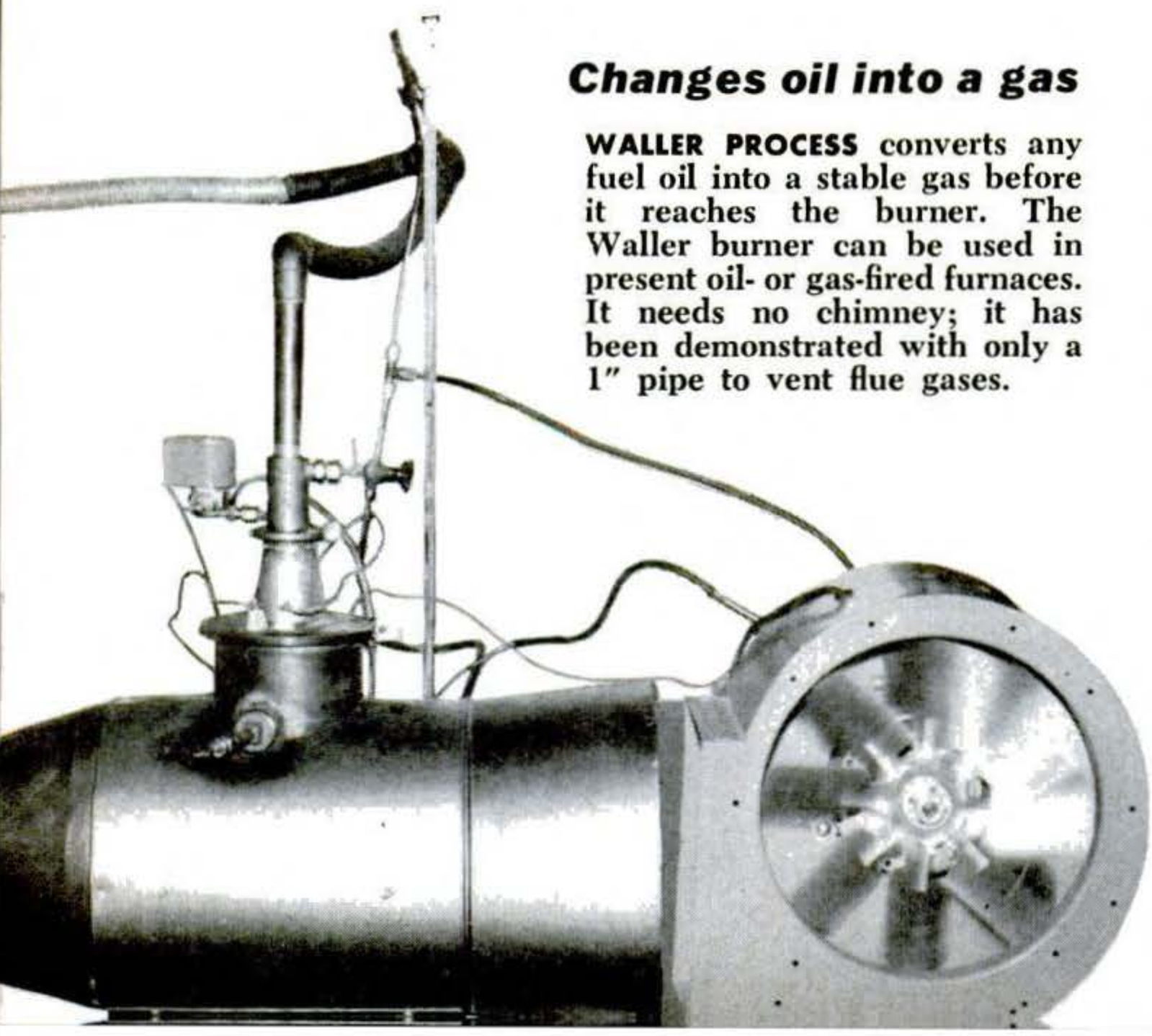
In the labs, and well on the way to the production line, are oil-fired air conditioners, clothes dryers, incinerators, refrigerators, and a home generator that may supply electricity for about half what you now pay.

It is becoming increasingly clear that the gleam in the oil industry's eye is a home in which you'll need only one fuel—theirs.

What sparked this sudden surge of development, this rush to perfect new equipment? The oil industry is scared. It's been losing out to gas at an alarming rate. To recover lost ground, the big oil suppliers themselves have gone in heavily for equipment research to supplement the efforts of manufacturers. Home heating has received the most attention so far. But the wide variety of research projects underway shows they are determined to get a share of the booming market in power-assisted housekeeping.

Furnace without flame. Two burners soon to appear on the market are totally unlike any ever seen before. They need no chimney, can be made no larger than the heater in your car, and utilize fuel at a fantastic 99-percent efficiency. One of these is a catalytic burner.

A catalyst, as you may remember, is a substance required in a chemical reaction, but that is not itself consumed or changed by the reaction. In the Pyrocore, developed by the American Thermocatalytic Corp. of Mineola, N. Y., the magic catalyst is a hollow cylinder of porous heat-resistant material. Fuel vapor and air flow into one end of the cylinder, go



Changes oil into a gas

WALLER PROCESS converts any fuel oil into a stable gas before it reaches the burner. The Waller burner can be used in present oil- or gas-fired furnaces. It needs no chimney; it has been demonstrated with only a 1" pipe to vent flue gases.

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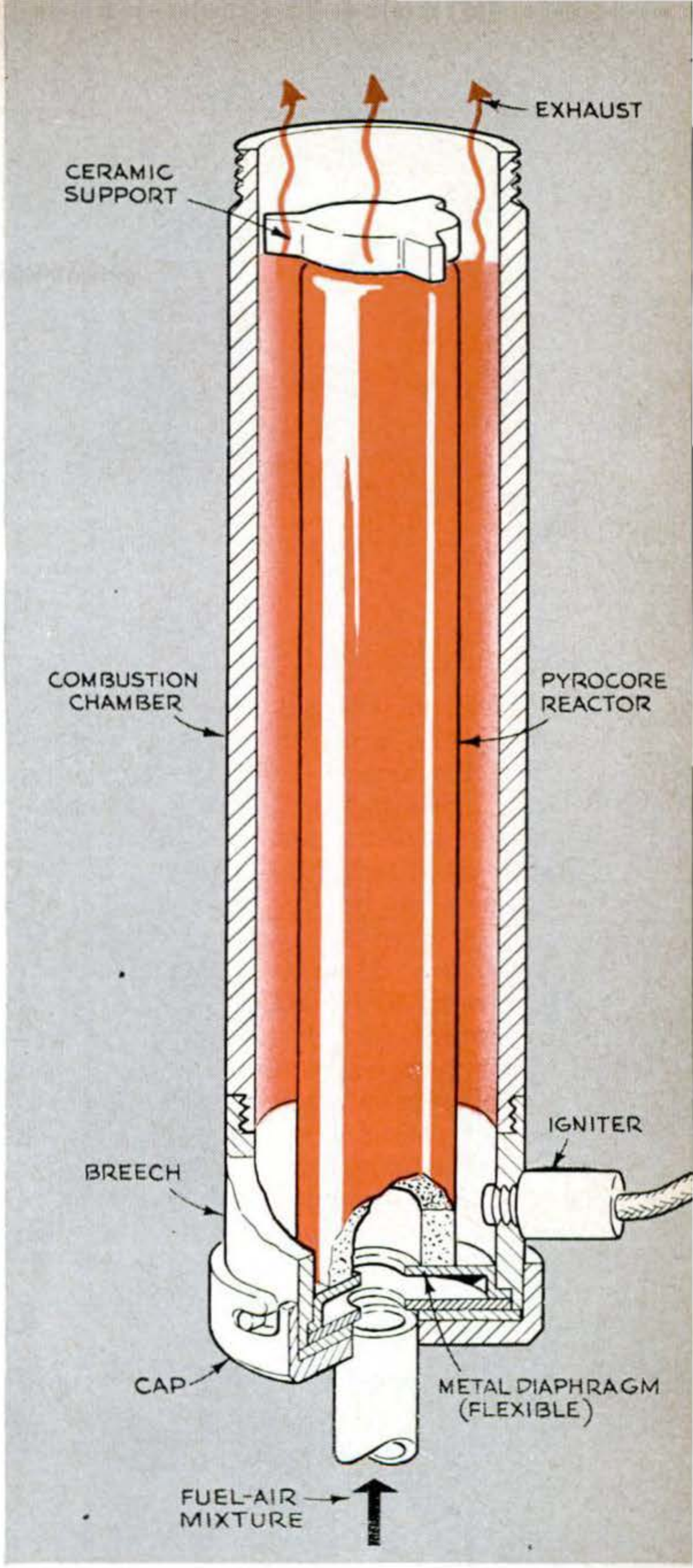
Cheaper

through the porous walls and burn at the outer surface. The entire outer surface glows like a gas mantle, without visible flame. Yet a unit 10 inches long and two inches around can give off an incredible 50,000 BTU per hour. Two or more units can be joined to produce as much heat as you want for a central heating plant, or individual units can be placed around the house for direct heating.

A complete warm-air furnace in prototype is only the size of a shoe box. A boiler is similarly small. Pyrocore has further home applications for such things as refrigeration, air conditioning and water heating. Marketing of Pyrocore heaters is still at least a year away.

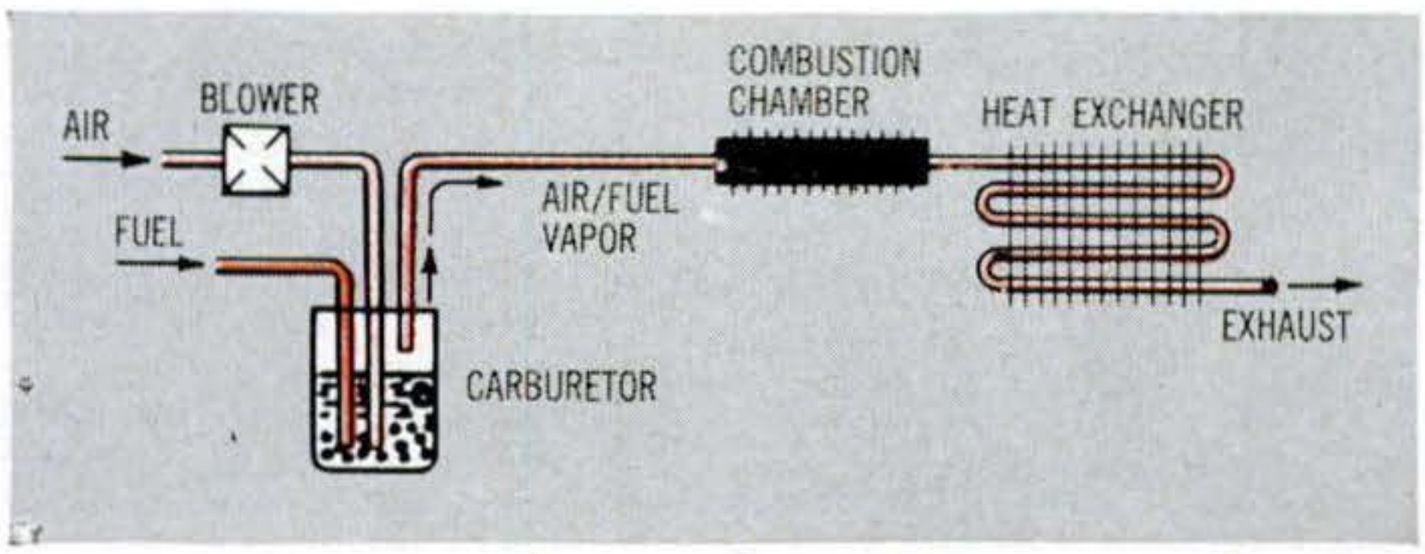
Another compact heater, the Waller furnace designed by William J. Waller of Beacon Falls, Conn., has already been licensed for manufacture, and assembly lines should be rolling this winter. Reports are that first sales will be to large-scale builders, but conversion burners should soon be available.

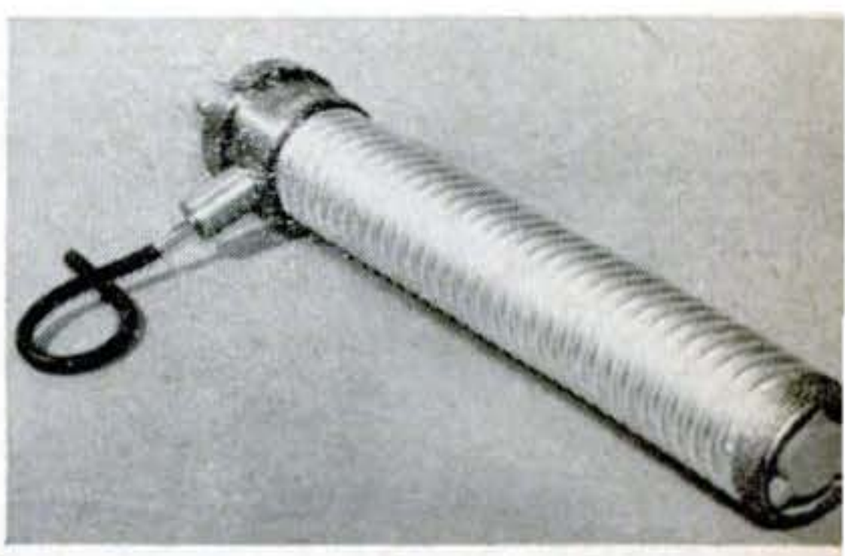
Somewhat larger than the Pyrocore units, the complete Waller furnace will



Glows like a gas mantle

HEART OF THE PYROCORE REACTOR is a hollow cylinder of porous refractory (heat-resistant) material, closed at one end. Fuel vapor and air flow into the open end of the cylinder and pass through the porous walls. Combustion takes place at the outer surface, but there is no visible fire or flame. The surface glows fiercely, producing over 1,000 BTU per square inch.





LIQUID FUEL AND AIR under several pounds' pressure are mixed in a carburetor and fed to the burner. From 70 to 85 percent of the heat is transferred to the jacket surrounding the Pyrocore unit. Practically all the remaining heat is recovered in the secondary heat exchanger.

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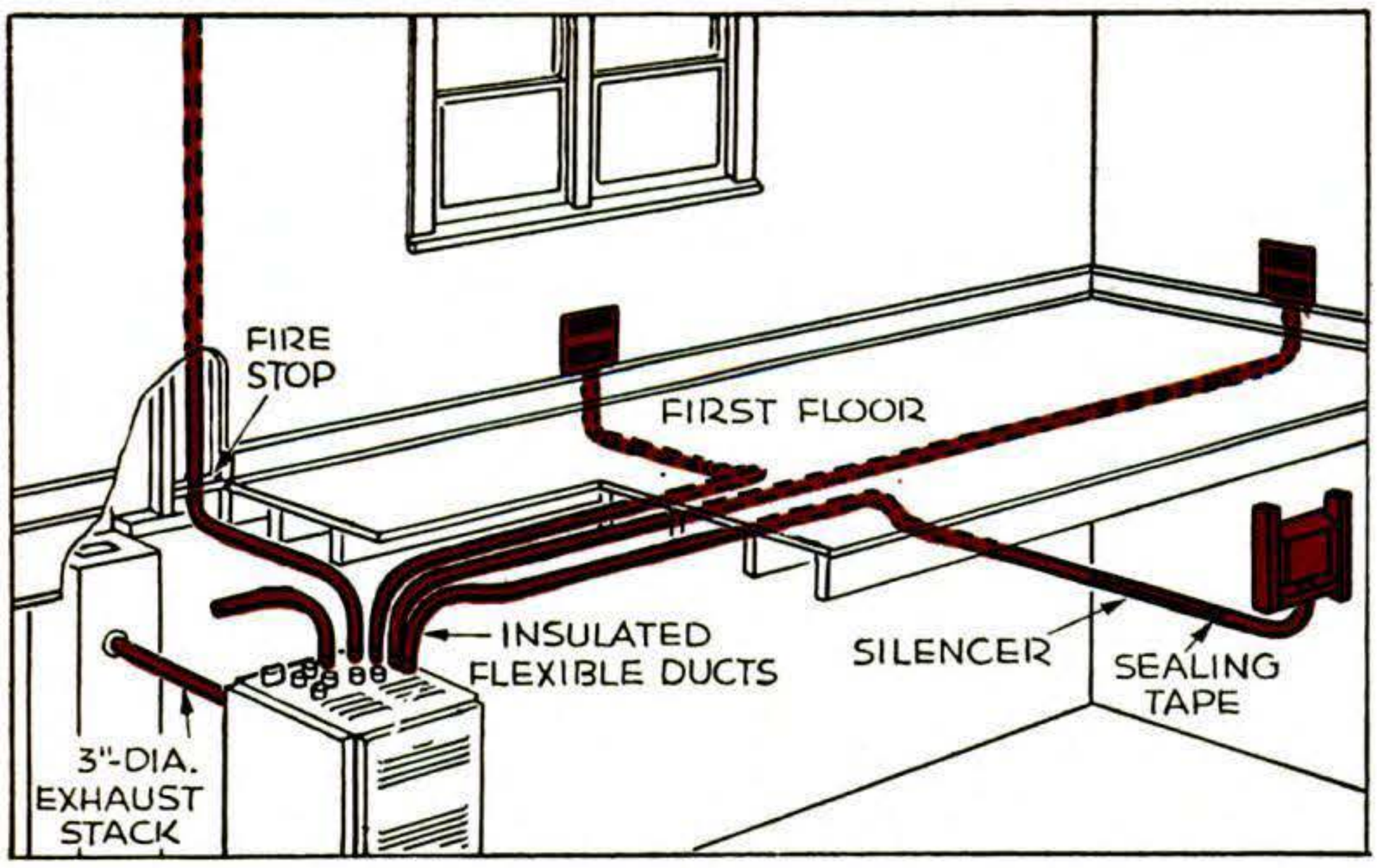

Prefab air system has flexible ducts

LOWER INSTALLATION COSTS result from the use of small-diameter insulated flexible ducts in the Jet-Heet system. These can be installed almost as easily as BX cable. Filtered and humidified air at 350 degrees is delivered to each room register. A venturi system mixes enough room air with it to give required volume and temperature before air enters room.

be a third the size of a standard oil unit, two-thirds the size of a gas unit. Claims are that it will burn just about any kind of liquid fuel, including oil too crude for conventional oil burners, and requires no adjustment in switching from one fuel to the other. Its heating capacity is extremely flexible. A typical model can be throttled way down to 10,000 BTU or opened up to 65,000 BTU.

The liquid fuel is converted into a stable gas before it is mixed with air and before the point of combustion is reached. Air under pressure is precisely metered into the combustion chamber. This chamber is tiny compared to those in conventional furnaces—it's measured in cubic inches rather than cubic feet. The burner nozzle is surrounded by a shell of refractory material which becomes incandescent when the unit is operating.

Both the Waller and Pyrocore units are said to utilize fuel at better than 99-percent efficiency. This means that just about every one of the 140,000 BTU you pay for in a gallon of No. 2 fuel oil can be put to work heating your house. With ordinary equipment, if you get 80 percent of this potential heat, it is considered worth bragging about, and 85-percent efficiency is the theoretical maximum at a standard 400-degree stack temperature.

How do these new burners succeed in breaking through this theoretical heat barrier? By reducing stack temperatures

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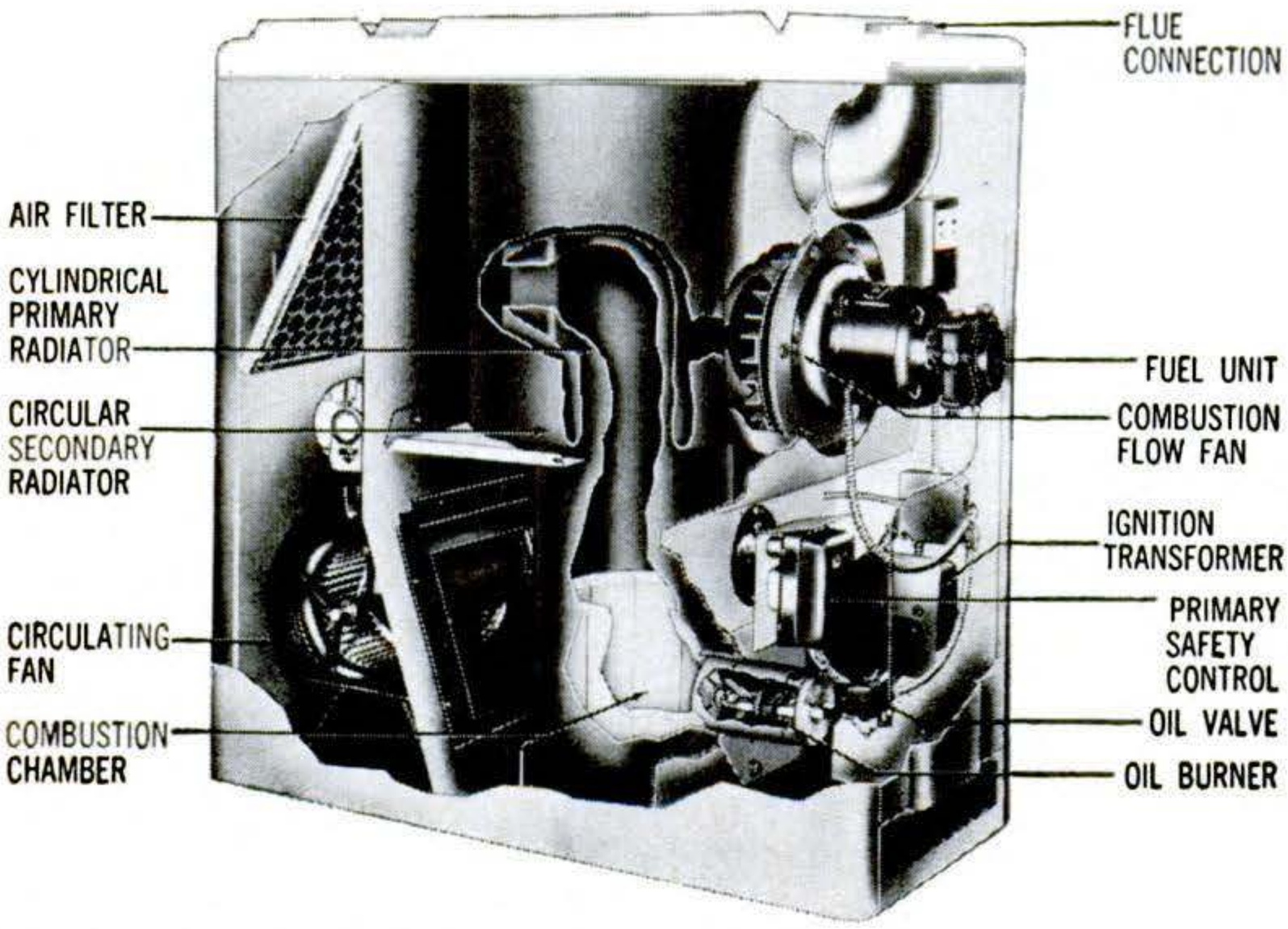

Draft without a chimney

COSTLY HIGH CHIMNEY is eliminated with this packaged furnace by Iron Fireman. Since it doesn't depend on natural draft, there is no warmup period. This gives instant clean flame start which allows shorter, more frequent firing periods. Result: more even temperatures. Induced draft also cools nozzle, preventing baked-on deposits—a major cause of oil-burner service problems.

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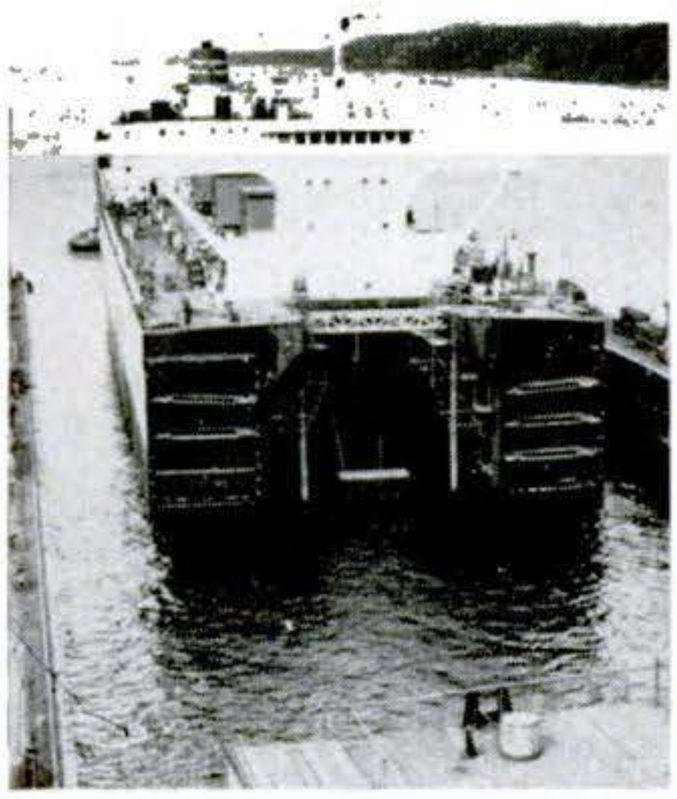
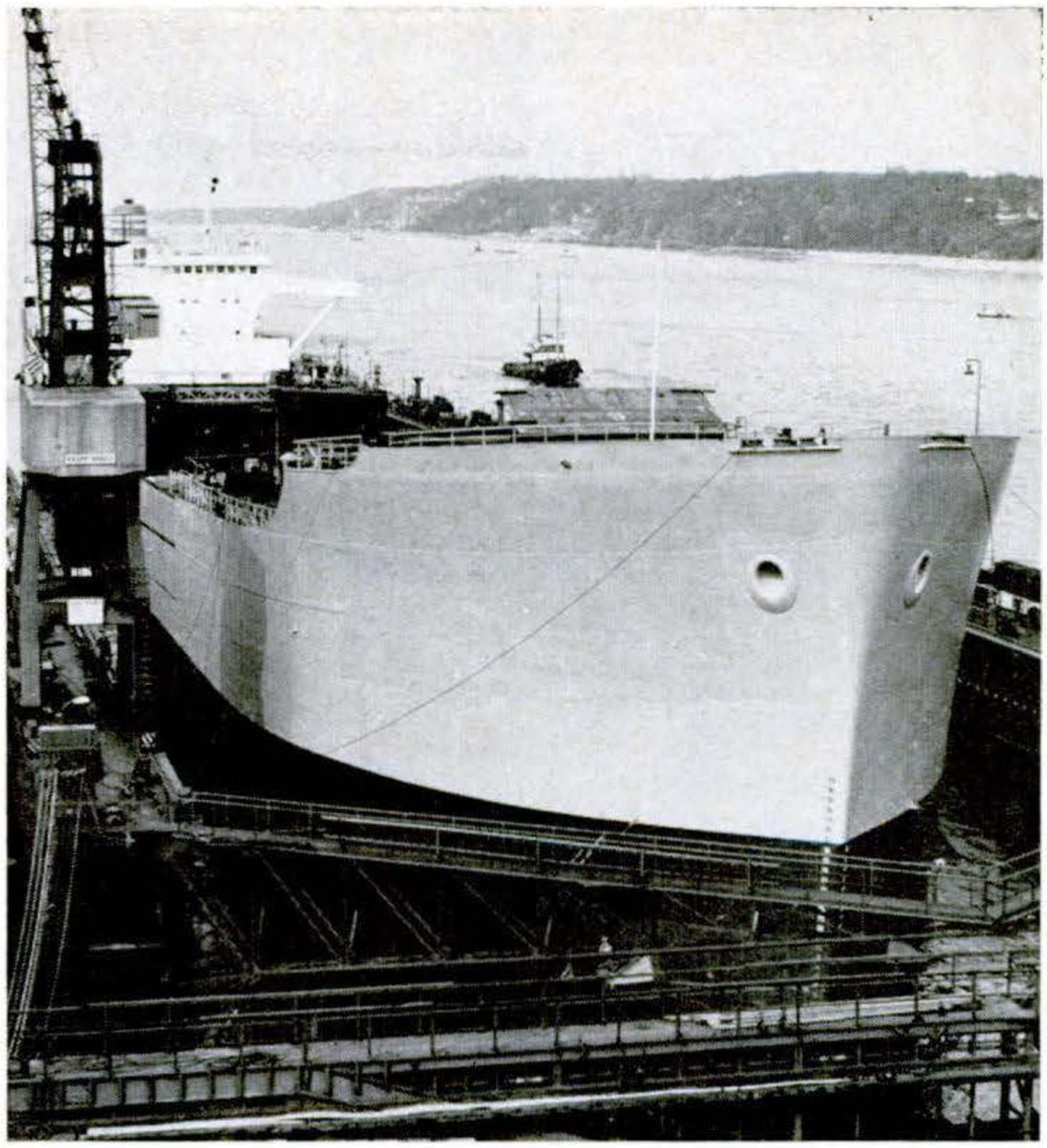
First the prow is launched . . .



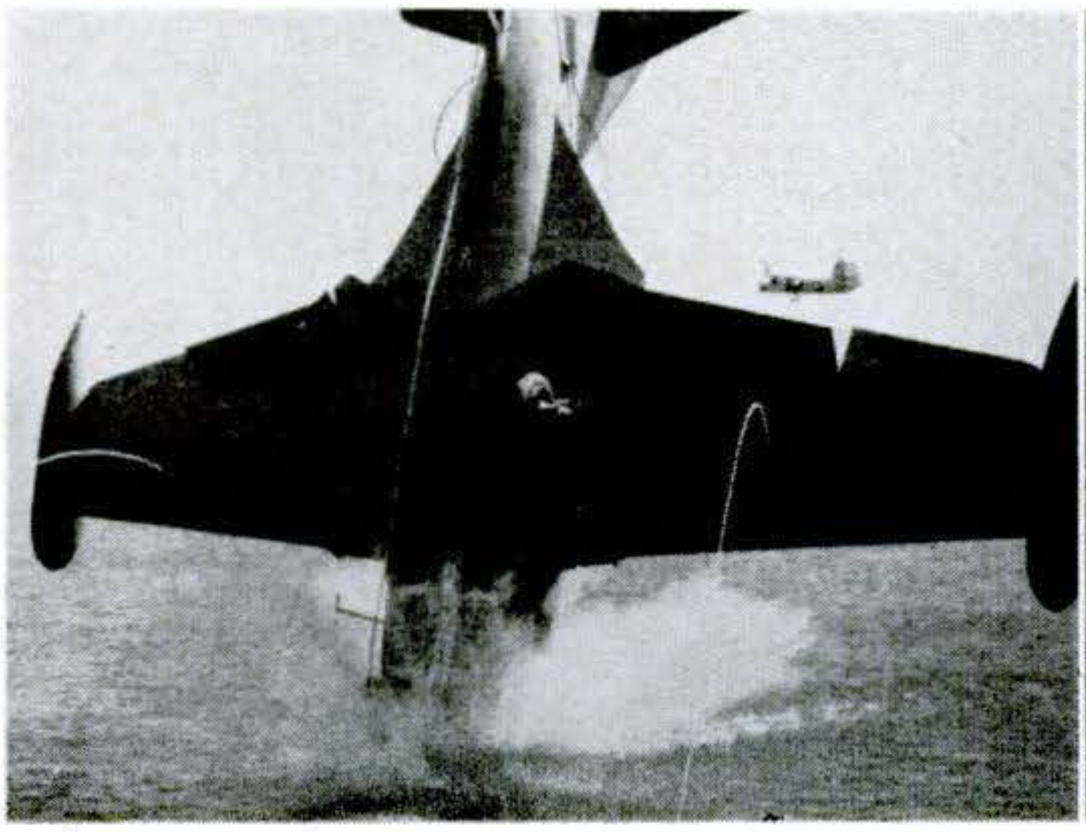
. . . then the stern . . .



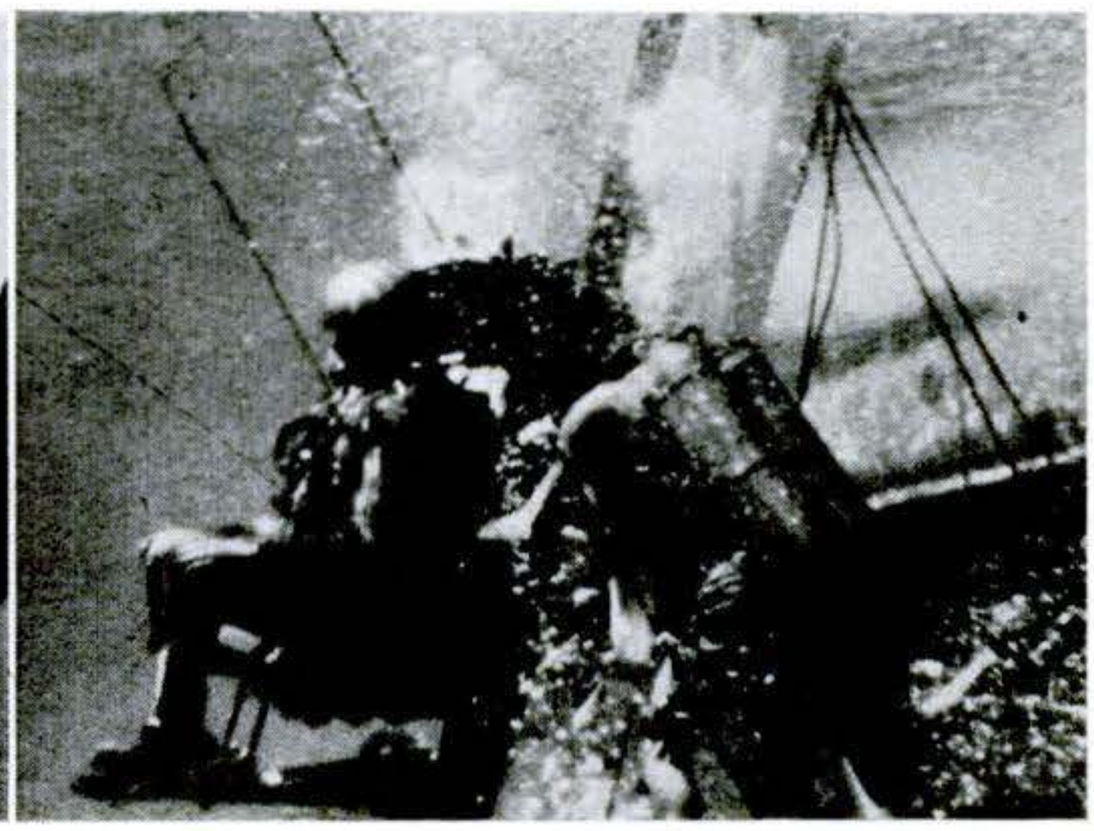
. . . and the two are floated together and welded into one piece.

GERMAN FREIGHTER BUILT IN HALVES

Dockyards in Hamburg, Germany, are constructing freighters a new way. They build the ships in two sections, launch them, then weld the floating parts together. It saves time, does away with layoffs while workmen wait for their skills to be needed. The 600-foot Rio Barima, above, is the ninth ship built this way.



Robot F9F plunges into the Gulf of Mexico.



Diver examines dummy in plane's ejection seat.

ESCAPE IN THE DEEP

The Navy is testing pilot escape seats underwater off Key West, Fla. Divers watching the ejection of dummies from robot planes found that the seats could be made to work fine, but are much too fast. A pilot shot out would be injured severely by the force of water drag.

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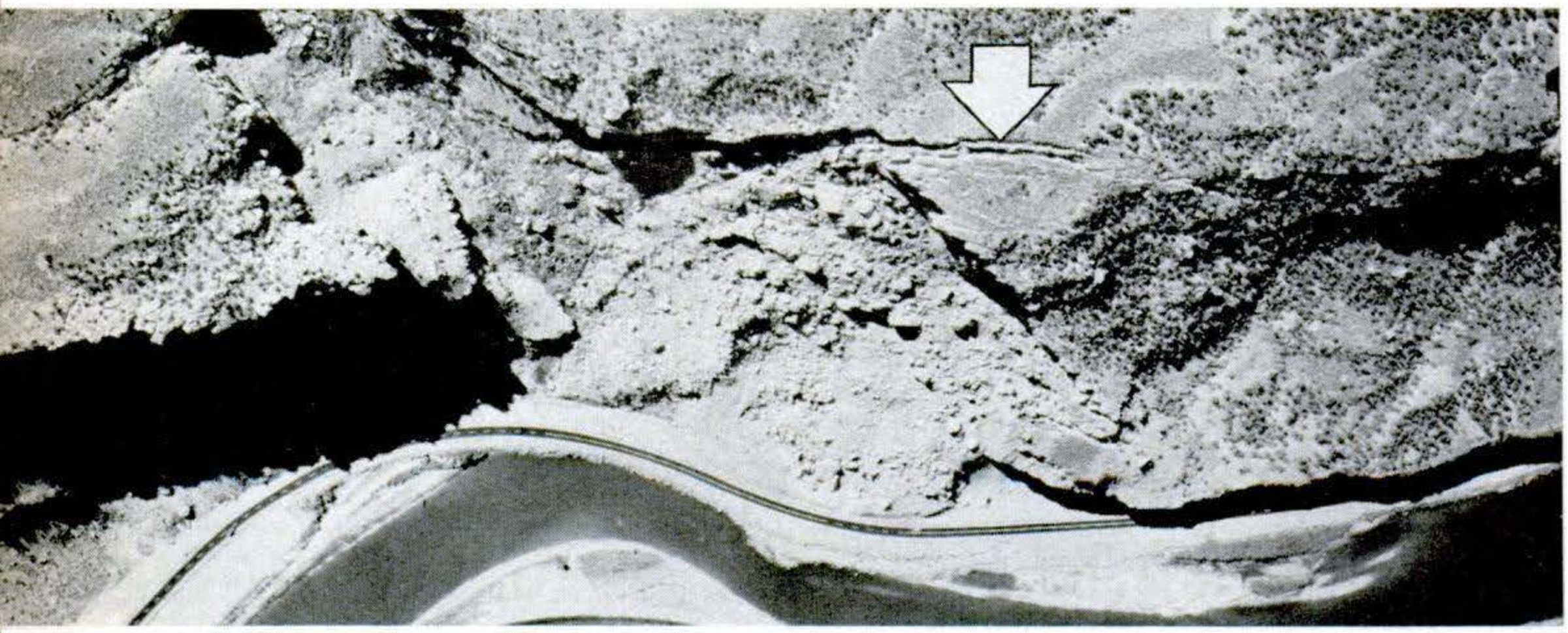
Taming the Mad Mountains

Highway engineers dig into the secrets of what sets off landslides and learn new tricks to stop them in their tracks



AERIAL PHOTOS GIVE CLUES. Here cracks (arrow) warn engineers of a hillside section ready to come tumbling down. Jumbled rock mass just to left is debris from previous slides.

By Ann and Myron Sutton

ROAD builders are rushing new weapons into the recurring battle against sagging, slipping, sliding mountains.

Each year in the U. S., often without warning, homes and highways are buried, pulled apart, or broken to bits by an awesome natural juggernaut: the landside.

HORIZONTAL SLIDE mutilated Nicolet, Quebec, in 1955 when rise in ground water pressure lubricated subsoil layer of clay on gravel.

Only last August, at the height of the vacation season, slides let loose by an earthquake blocked mountain roads and buried several camping parties near Yellowstone Park. Because no one knew just how many tourists were in the area, the exact toll in lives could not be counted.

Earlier, on May 27, near Santa Monica, Cal., a roaring slide heaped more than 600 tons of dirt and rock on the super-speed Pacific Coast Highway between Los Angeles and San Francisco.

Five of the six lanes were jammed. By coincidence, a stop light had halted 50 motorists a few yards from the slide.

In the same area, two months before, a highway workman had been killed when buried by a slide. Two years earlier four women picnickers were swept down the bluff in a torrent of earth but were dug out uninjured.

Search for answers. Since U. S. landslide damage amounts to hundreds of millions of dollars annually, highway engineers have been trying to find out what triggers such roaring rockfalls and

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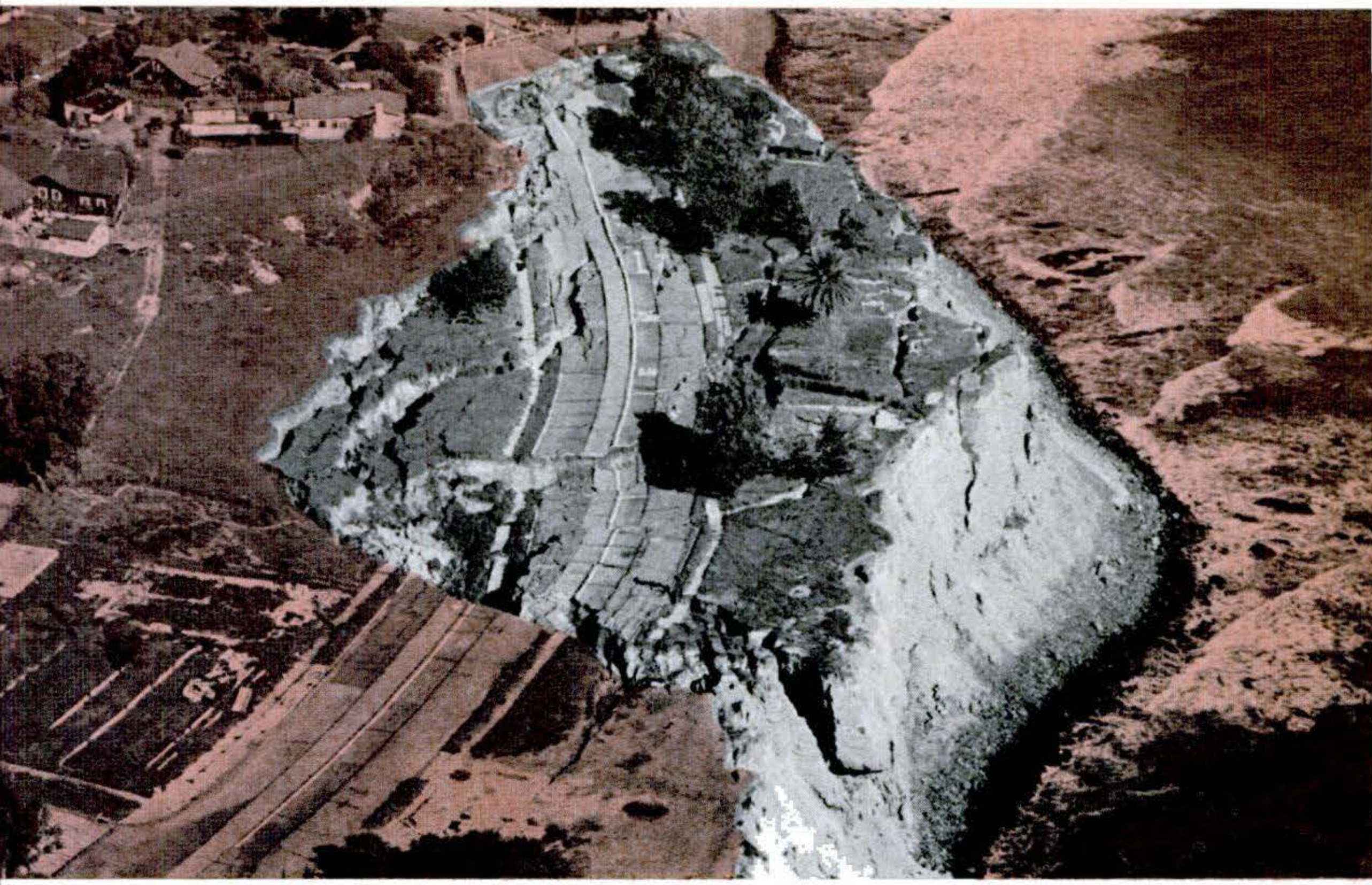

BIG BITE. Entire section of highway was sliced out and shifted seaward above cliffs at Point Fermin, near Los Angeles, in 1941. Gashes inland warn of still more trouble to come.

determine why they act the way they do.

Now the experts are coming up with some surprising discoveries and some neat tricks for taming the mad mountains.

This is no simple matter, considering the destructive power of slides.

Half a century ago the peaceful town of Frank, in the Canadian Rockies, discovered what it was like to be located at the muzzle end of a major landside.

The rains came. For days they sopped the shoulder of Turtle Mountain, a precariously balanced mass immediately above town. No one sensed danger; rains like that had fallen before. But when the cliff became so saturated that friction could hold it no longer, it broke away and splattered thousands of feet downslope, rammed through half the village, utterly demolished it, and obliterated nearly 70 people. It mangled 7,000 feet of track along the Crow's Nest Railway and roared at express-train speed to the far side of the valley, nearly three miles away.

Until recent years slides were looked upon as little more than what the Chinese called them: "a time when the mountains walked."

And the Chinese certainly should have known. In the remote province of Kansu, on Dec. 16, 1920, the peasants huddled down that evening in cave homes carved out of high cliffs of soft earth. As night came to the wind-chilled, treeless plains, a tremor jolted cliffs and valleys.

The ground cracked. Crevasses opened. Sand gushed out of the interior of the earth. Mountains collapsed. Rivers were dammed. Villages disappeared. One after another, smothering slides poured out over the plains and into the valleys.

The final toll: 100,000 to 200,000 dead.

The man-made slides. Modern road builders, slicing open the earth's surface, triggered more landslides than ever before. In the battle to keep the roads open, geologists, soil scientists and highway engineers have pieced together some of the mysterious inner workings of falls, flows, slumps, slides, glides and avalanches.

The Kansu slide, they now know, was no more mysterious than the sand in a

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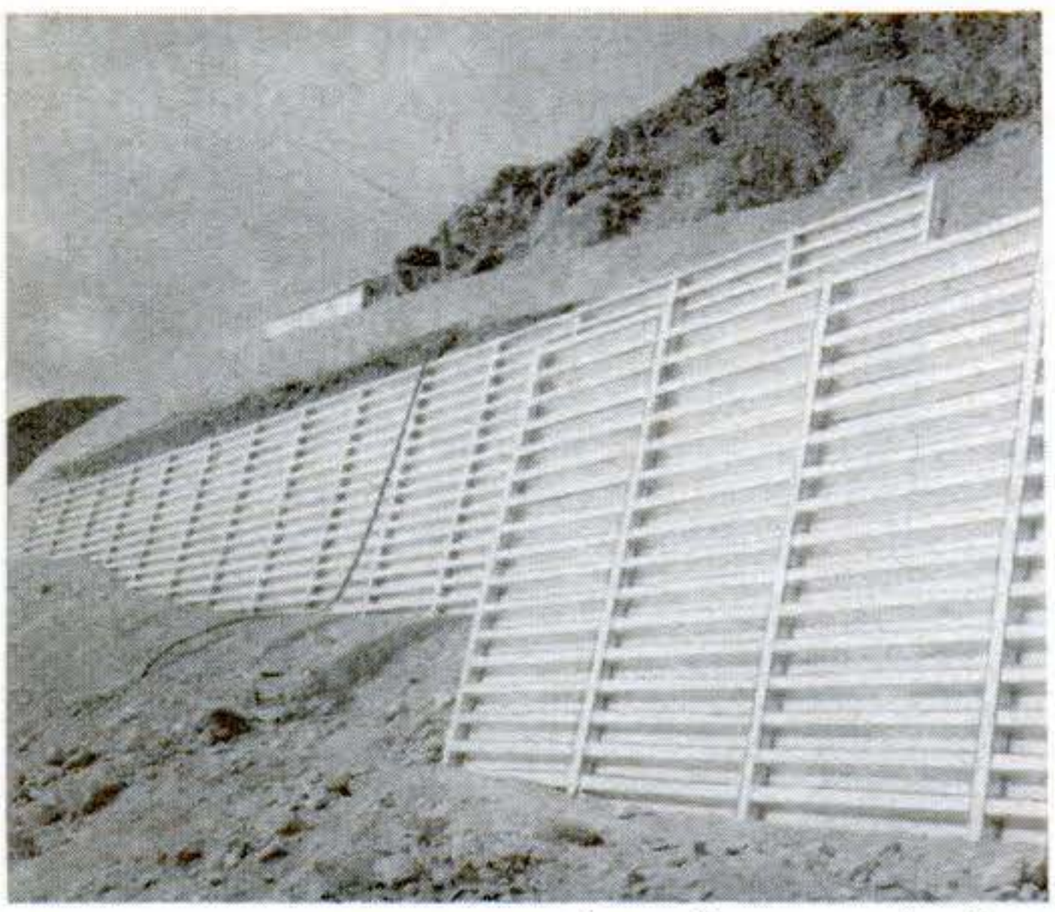
WIRE MESH being put up to combat rockfall near Kelso, Wash. The mesh doesn't stop a slide, but keeps rocks close to slope, letting them drop harmlessly into roadside ditch.

CONCRETE OVERCOAT: To hold back an unstable slope near Valona, Cal., engineers paved the entire surface. A grid of reinforced-concrete beams below it anchors the section firmly.



METAL RETAINING WALLS have been used effectively on treacherous slopes along new highway construction. Purpose of cribbing here is to keep the roadbed from sinking.

child's sandbox. The internal structure of the silt, normally strong enough to hold together, was shocked by the earthquake into a plastic condition. Great masses of suspended silt flowed like water, as happens on a smaller scale in desert dunes. The difference was that the Kansu disturbance covered thousands of miles and affected thousands of lives.

Once loosened by water (or by any other agent of weathering) all land is destined theoretically to be carried to the sea. This total erosion never happens, because the continents are periodically uplifted. But such mass wasting of land is a continuing process punctuated by some devastating slides.

What do landslides cost? It's hard to estimate. There are such indirect costs as traffic delays, damage claims, and interruptions of public services. Engineers calculate that the total runs into hundreds of millions of dollars a year.

One state alone reports yearly slide damage of over a million dollars, three states just under a million, and six over $100,000. Water backing up behind Grand Coulee Dam has caused slides costing upwards of twenty million dollars. An oil company in California spent more than a million dollars to control slides in a single field. One railroad company shells out between $500,000 and $1,000,000 a year to control and clean up after slides.

Highway threat. Of even more concern is the hazard to public safety. With America's growing road network being designed for high-speed, high-density traffic, one rockfall in the middle of one lane could bring multiple collisions with an appalling loss of life.

Yet highway engineers cannot remove every dangerous mountain. They cannot stop rainfall. They cannot abolish earthquakes. They cannot halt vibration. Only with great difficulty can they retard erosion or alter rivers.

One thing the engineers have learned is that sudden slides are not quite so sudden as they seem. Intensive study in recent years has shown that a coming landslide gives itself away by such telltale clues as road slumps, cracks in the earth, displaced paving, crooked fences.

But these are only surfaces signs. The basic trouble lies deeper. By a careful study of neighborhood rocks, soil, terrain

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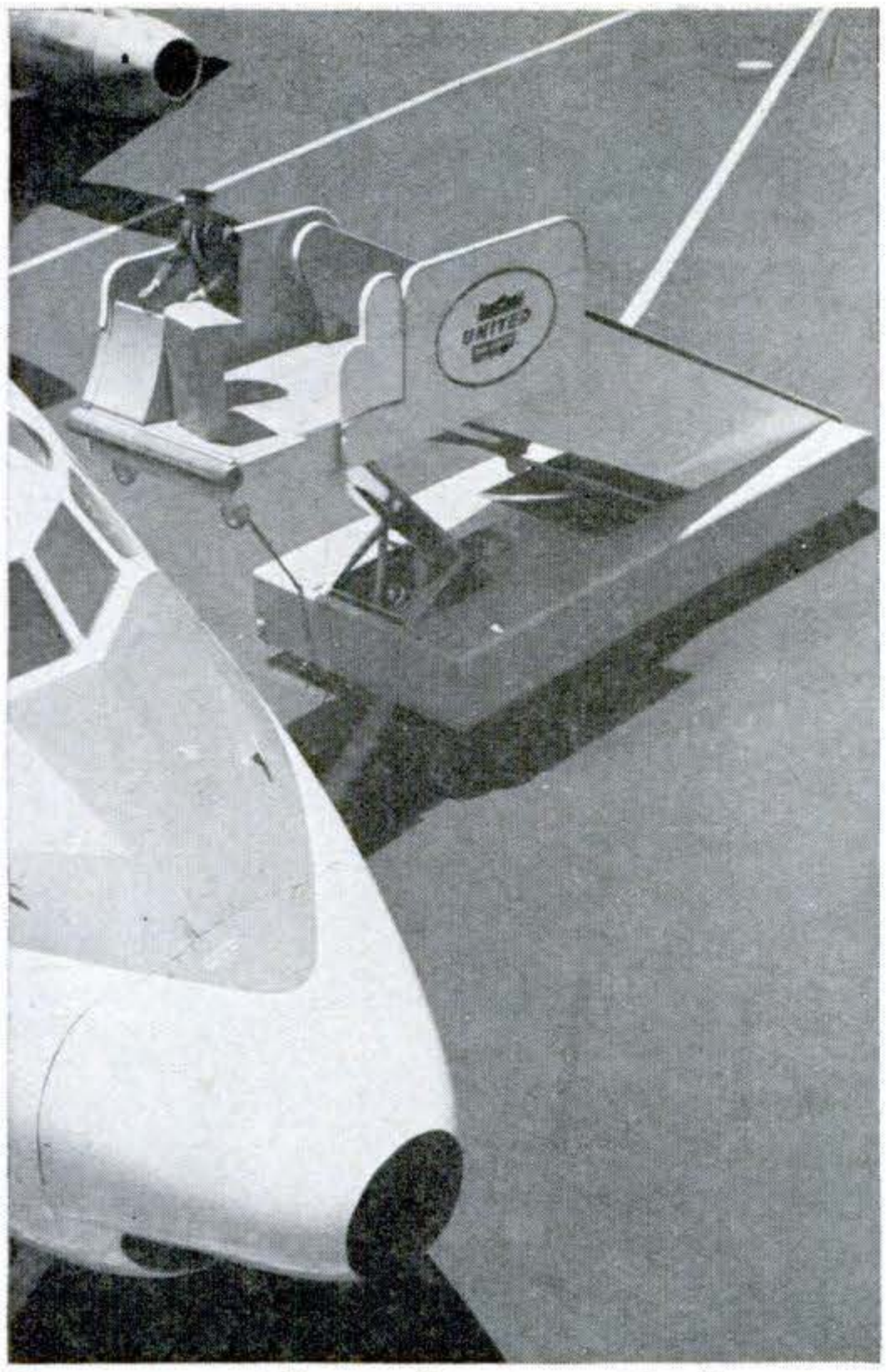
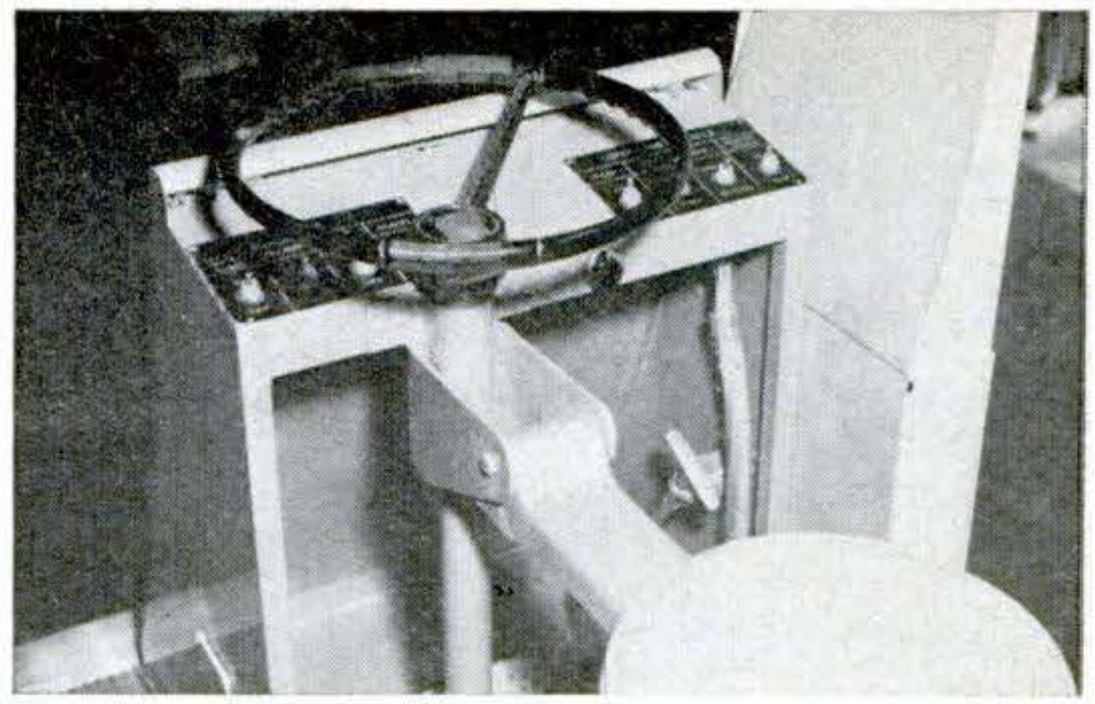
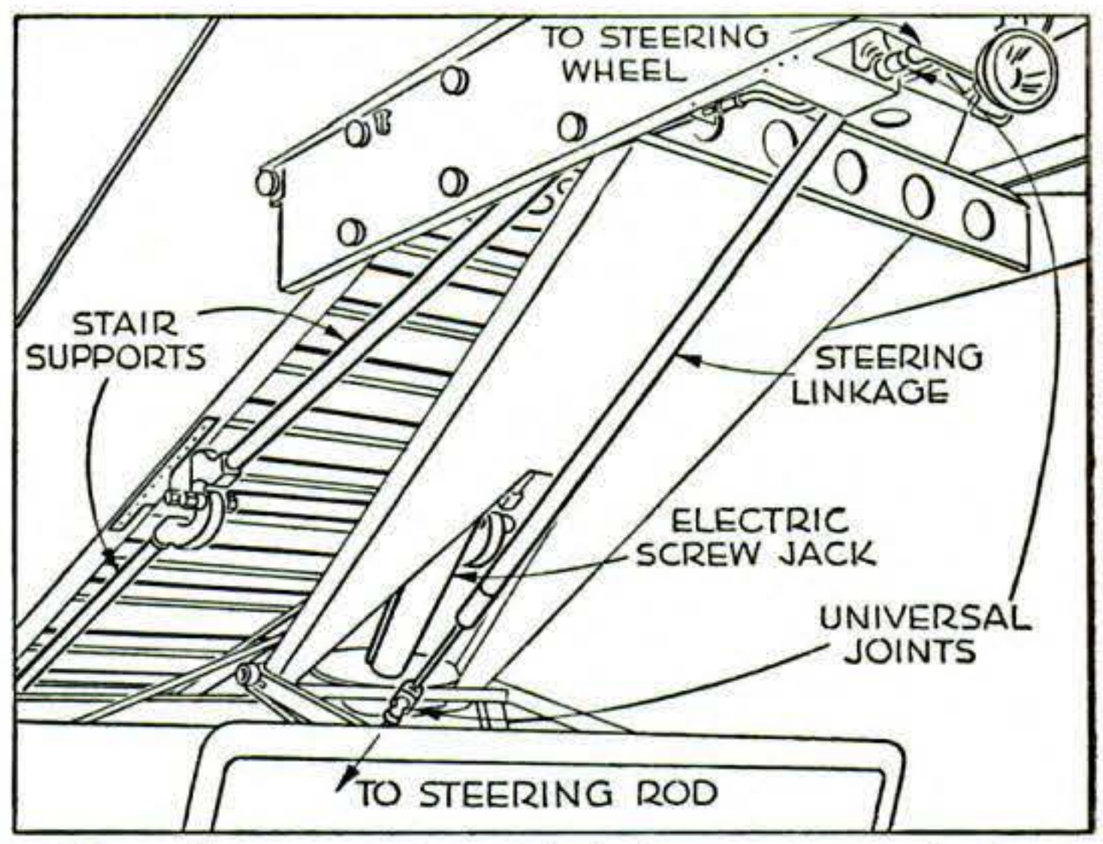


Ramp runs 3½ m.p.h. on a 36-volt motor.



Straddle seat and controls are out in the open.



How the ramp is guided from upper platform.

JET RAMP OPERATED FROM TOP LEVEL

Boarding platforms for United Air Lines' new coast-to-coast DC-8 jets are self-propelled. United has bought 52 from Consolidated Diesel Electric Corp., Stamford, Conn., and has an option on 68 more. Each can support 46 persons and is steered from the upper deck, which raises or lowers to meet an airliner's doors.

DRUM BUILDING. Grillework on this round office building in Miami was made with concrete blocks. From the top floor, the lobby can be seen through a center core. Parking lots are at the rear.

STEP ON IT, COWBOY. Herding at the stockyards in San Antonio, Tex., is done by motor. On a fleet of battery-operated Cushman vehicles like the one above, men now keep pace with the cattle.

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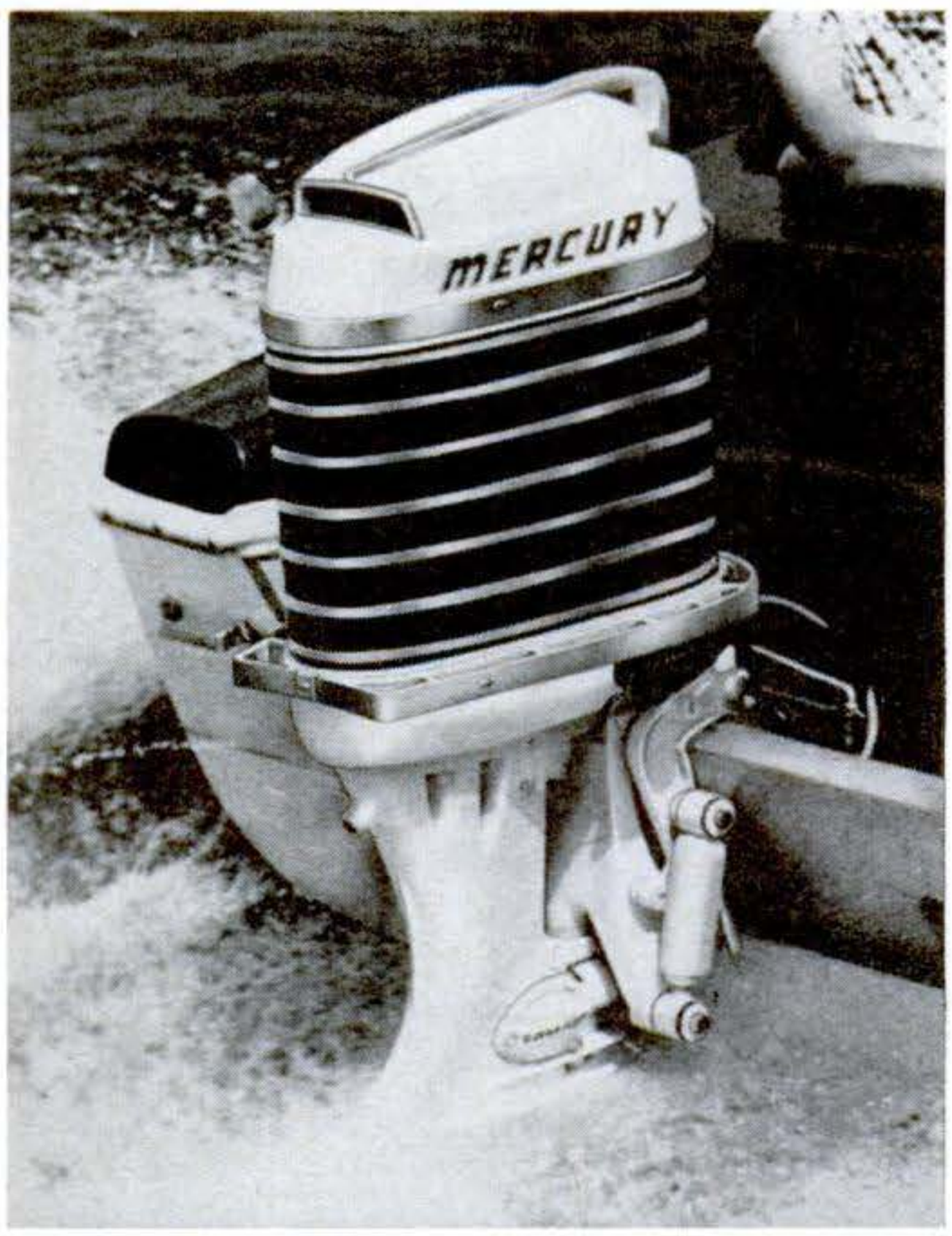
Preview of 1960 Outboards

ONE FOR FISHERMEN. The new Scott 7.5-hp. motor weighs only 34 pounds—27 pounds less than last year's. McCulloch Corp. did it mainly by shortening the motor seven inches. It's now 30 inches long. They also switched from steel to cast-aluminum connecting rods and made the hood cover of plastic. The new propeller is said to be weedproof because of its three back-swept blades.



TOPS IN POWER. The Merc 800, an in-line six, leads the horsepower race with an 80-hp. rating. Propellers varying in pitch from 7½″ to 23″ are fitted by dealers according to users' requests. One lever controls both throttle and shifting.

EXTRA AMPS. A 25-ampere alternator-type generator is standard on this 40-hp. West Bend. It's designed to handle such accessories as running lights and radiophones without letting the battery run down. It has an auto-type regulator.

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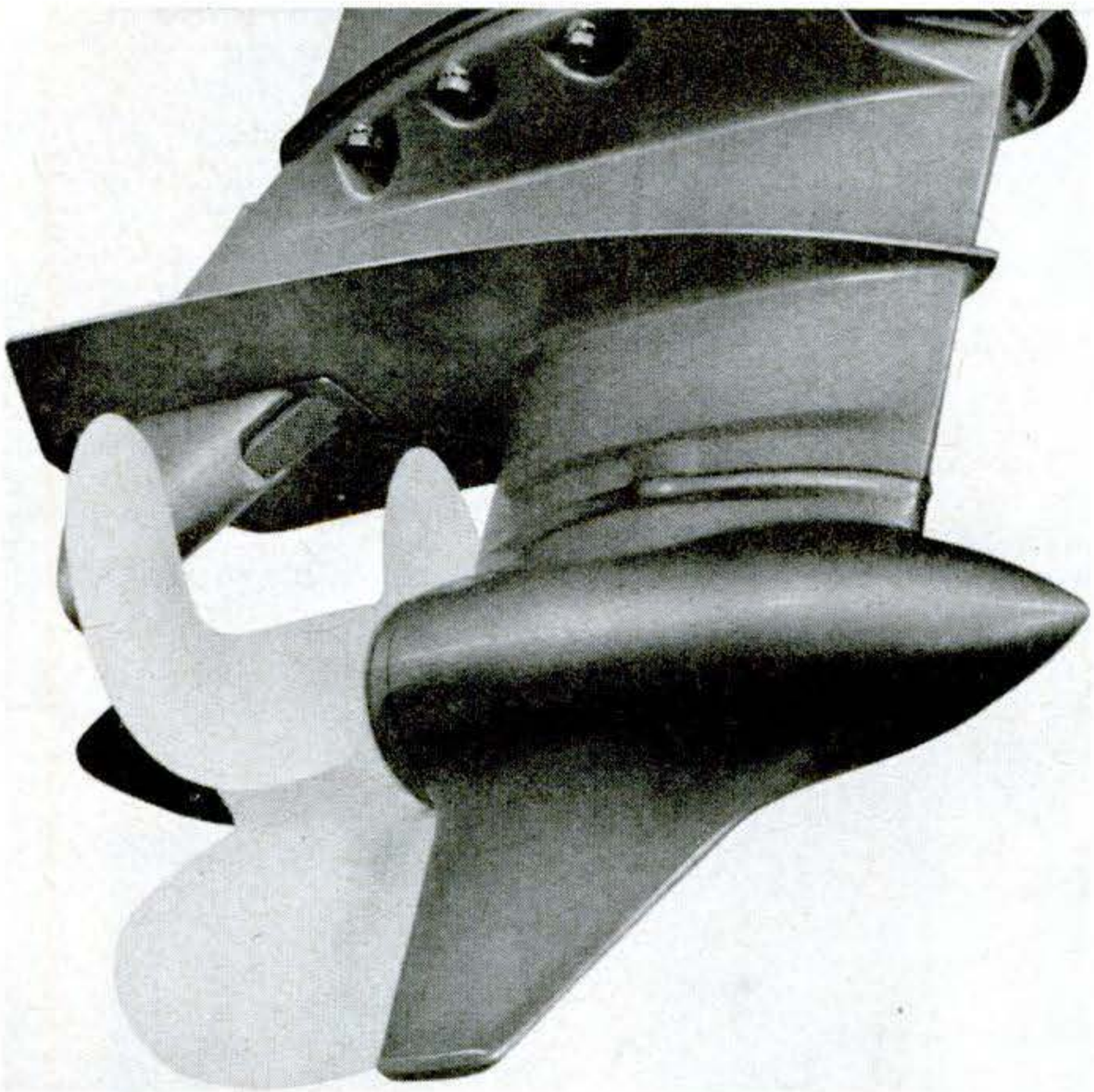
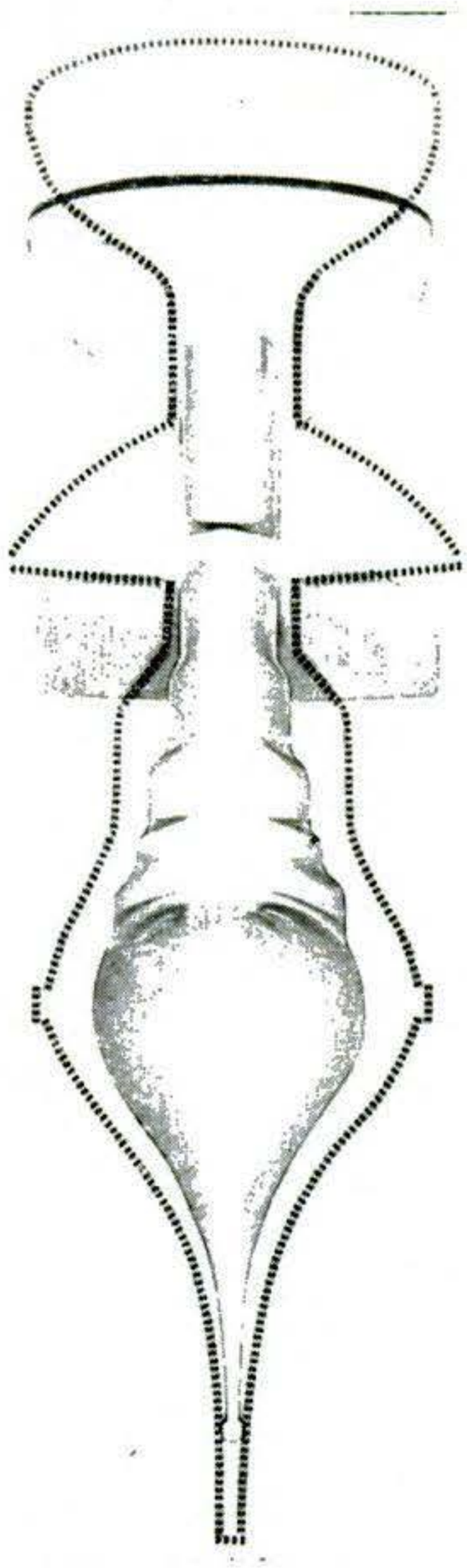
AUTOMATIC CHOKE. Evinrude's biggest, the 75-hp. Starflite II, is the first outboard to have an automatic choke. Easier starting, better operation, an end to flooding are claimed. Also new: double-action hydraulic shock absorbers that cushion jolts caused by the lower unit hitting a submerged object.





STREAMLINING CUTS DRAG. Its gear case slimmed down, the Johnson Super Sea Horse V-75 knifes through the water faster. To make the smaller housing possible, the propeller-shaft gear now has fewer teeth. Engine speed remains the same, but the prop turns faster. Three sizes of propellers are available.

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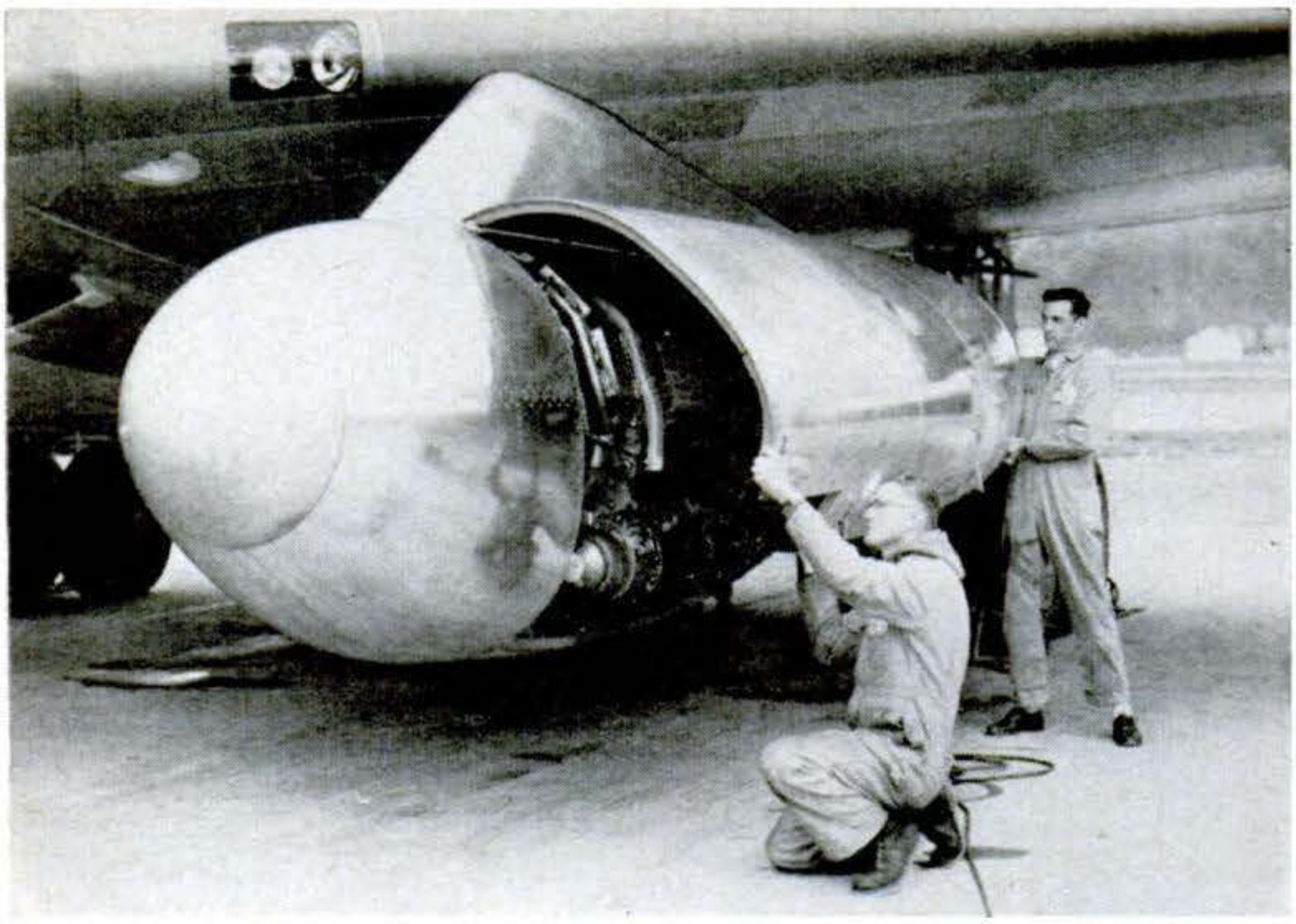


Spare turbojet is easy for mechanics to reach and remove from pod.

Arrow points to the fifth engine under the Boeing 707's left wing.

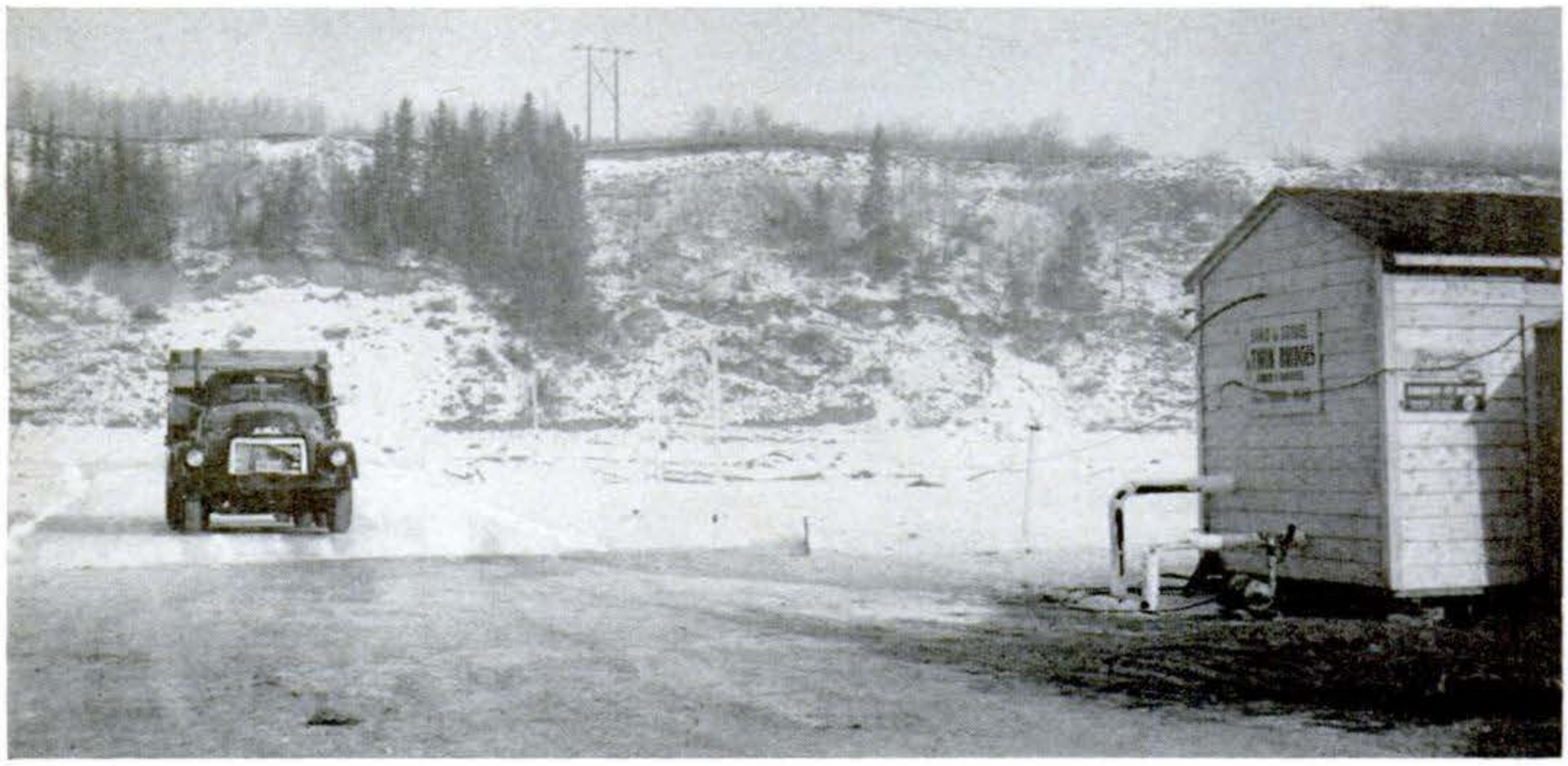
SPARE JET RIDES ON AIRLINER

Here's a Boeing 707 jet with a fifth engine that rides in a Pod-Pak mounted near the fuselage.

Reason: Big overhaul bases on Australia's Qantas World Airways are widely spaced. The fast jet liners take along a complete replacement power plant so that a quick change can be made if anything goes wrong with one of the engines in operation.

Engines need be stocked only at major airports. At others, when a new engine is wanted, the spare is taken out, installed in place of the engine that has gone sour. The old one is put in the pod and swapped in at the next big base.

ICE BRIDGE. A heavy gravel truck below is going over a bridge frozen in the river by the ice house at right. The 30-foot-wide crossing is on the North Saskatchewan near Edmonton, Canada, and provides a cheap 3½-mile short cut. From October to late March, it's kept frozen by pipes from the 75-hp. plant.



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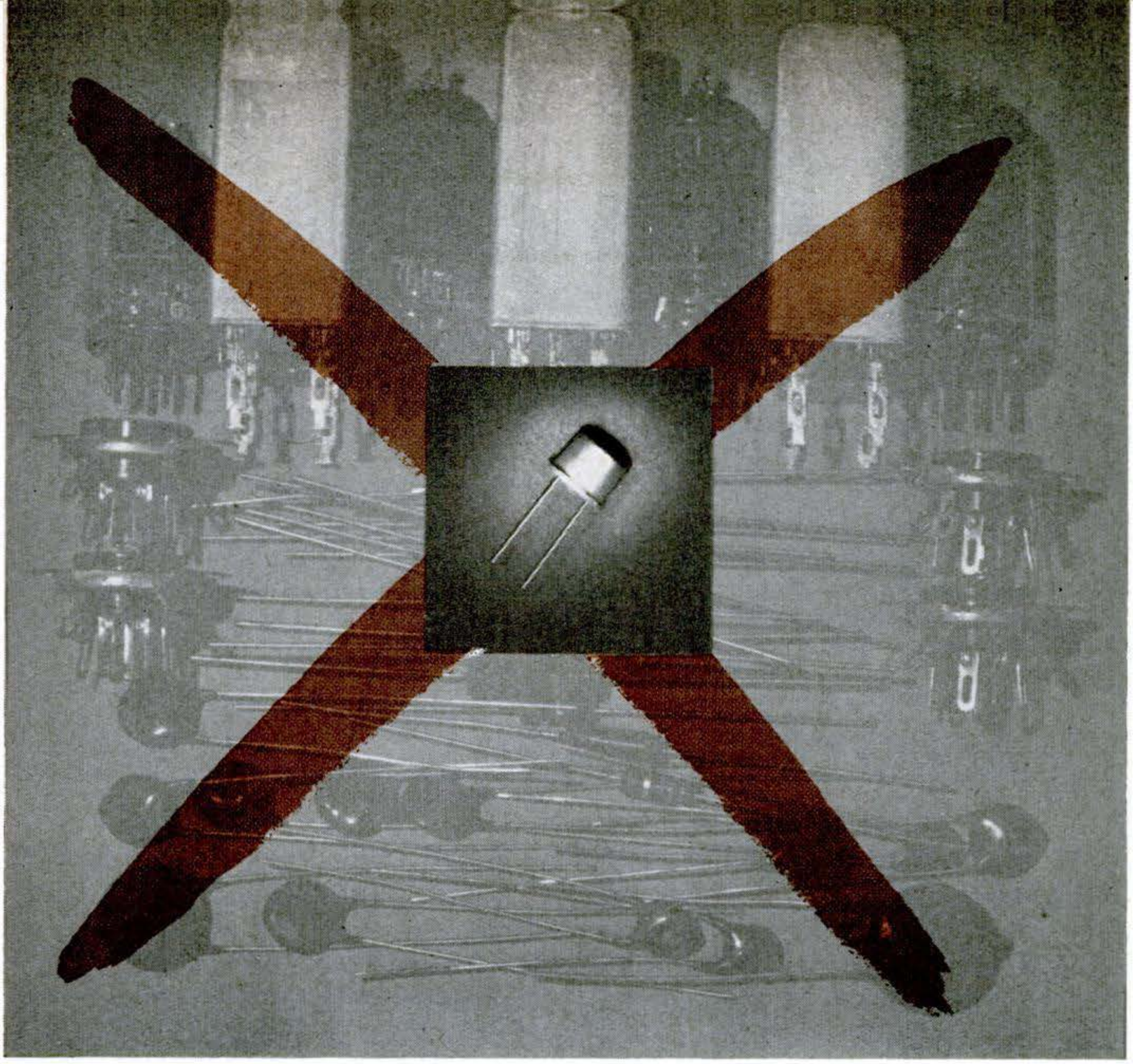

One tunnel diode (center, magnified) could replace all FM radio parts shown in background.

Tunnel Diodes: Even Better Than Transistors

New super-crystals outperform tubes or transistors for TV, FM portables, wrist radios

By Martin Mann

IT'S a slow week in the electronics business when somebody doesn't come up with a widget better than the transistor. This time, though, it looks like for real. The new widget is called a tunnel diode. It's a speck of shiny gray crystal. It will do anything a vacuum tube or transistor can, only better, plus a lot of things they can't.

The tunnel diode should move a lot of enticing products out of the labs and onto the assembly lines: wrist-watch radios cheap enough and useful enough for nearly everybody; telephone-quality mobile radio for cars and taxis; portable, pocket FM radios; inexpensive battery-powered TV sets; simple communications

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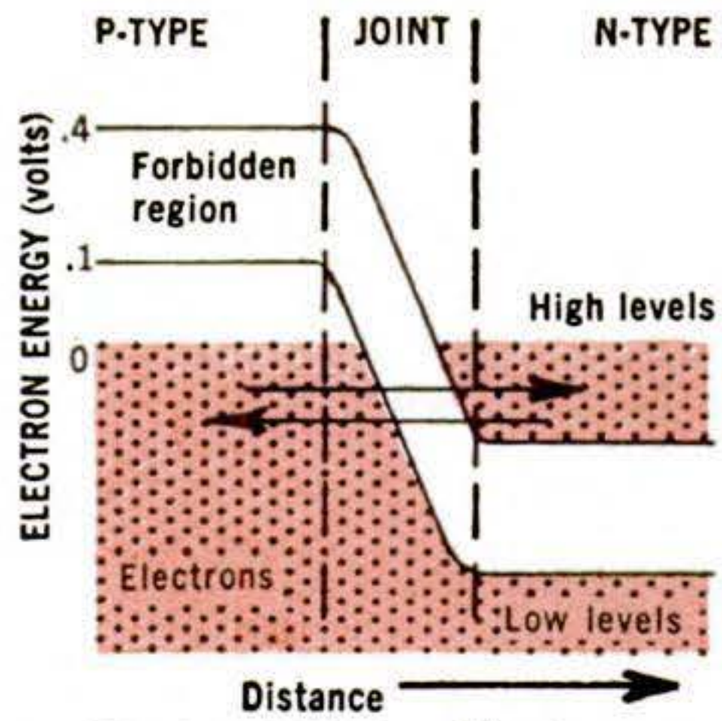
How the Tunnel Diode Works

The tunnel-diode amplifier is just two specks of crystal, one slightly different from the other, fused together. The key to its operation is the modern picture of the way electricity acts.

The elementary units of electricity, electrons, can have many different energies—but not *all* different energies. They're like paper money, which comes in values of one, two, five, or 10 dollars, but not 2½ or seven dollars. Electrons are restricted to certain "permitted" levels of energy: a group of high levels and a group of low levels. Intermediate energies—between the groups—are "forbidden." The exact values of the permitted and forbidden energy levels are different for different materials.

The tunnel diode exploits the differences in energy levels to make a weak signal voltage control a strong current. The voltage does this by shifting electron energies in one side of the diode relative to the other so that sometimes current flows easily between the two, and sometimes it doesn't.

The diagrams at right show how an increasing voltage influences current flow. The energies of the electrons are indicated graphically over a magnified cross section of a tunnel diode.



1. ZERO VOLTAGE. Electron energies are equal on both sides of diode. Electrons "tunnel" back and forth across joint, but just as many go one way as the other. So the net current is zero. Notice that the p-type semiconductor on left side has room for more electrons at low levels, below Forbidden Region. N-type semiconductor on right side has its low levels filled with electrons, and surplus electrons in its high levels, above its Forbidden Region.

via moons (natural or man-made); electronic brains of near-human intelligence.

The impact on television, particularly, could set off a chain reaction. Tunnel diodes promise TV receivers of vastly greater sensitivity, able to produce good pictures far, far from the station. And that could trigger a long-repressed explosion in television broadcasting that would multiply many times the number of stations on the air. You'd be able to choose from dozens of programs instead of a few.

YOUNG INVENTOR of new amplifier is 34-year-old Leo Esaki, physicist for Sony Corp. in Japan. American version is already being made by GE.
Photo by Electronic News

What's so hot about the tunnel diode? Look:

- It's cheap. An RCA man said, exaggerating only mildly, "You make these things out of the sloppy old germanium they throw away at the transistor factories."
- It's small—a few thousandths of an inch across. With leads and everything, GE's prototype could get lost inside a paper clip.
- It handles electricity at all frequencies, including the extremely high ones where tubes puff hard and transistors fall flat. It's a natural for TV and FM radio.
- It runs on practically no power at all: 1,000 times less than the notably unhungry transistor eats, 100,000 times less than a tube. This means that radios—and maybe TVs, too—wouldn't even need flashlight batteries, let alone power cords. The feeble juice from a sliver of a solar cell would be enough.
- It's quiet. That is, it amplifies extremely weak signals without mixing in static. This is of major importance, a real breakthrough for everything from space communications to taxicab radios and

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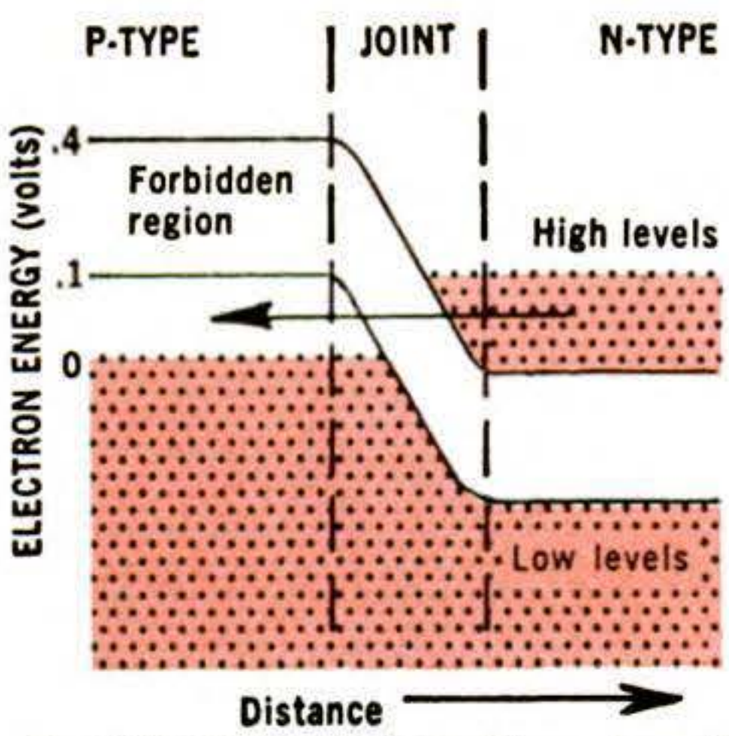
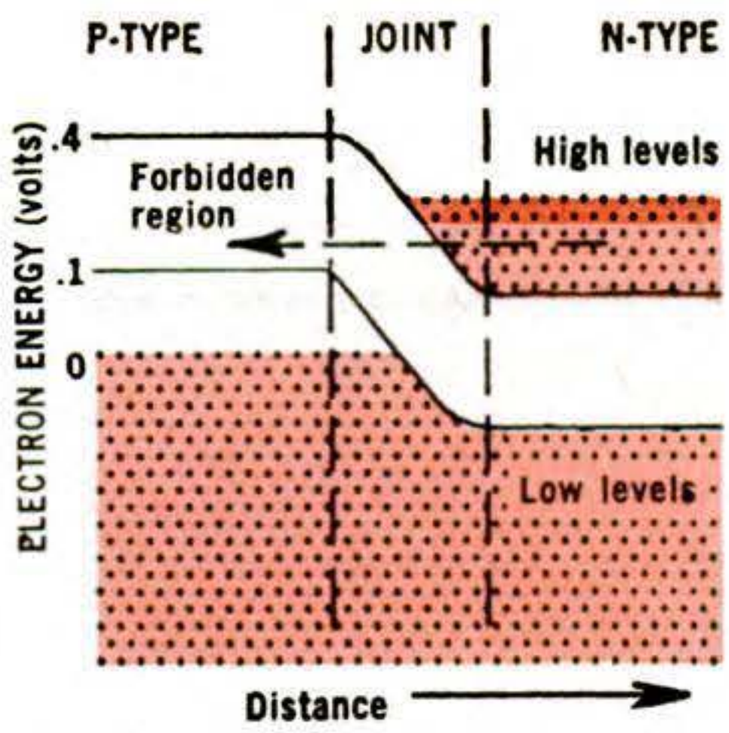
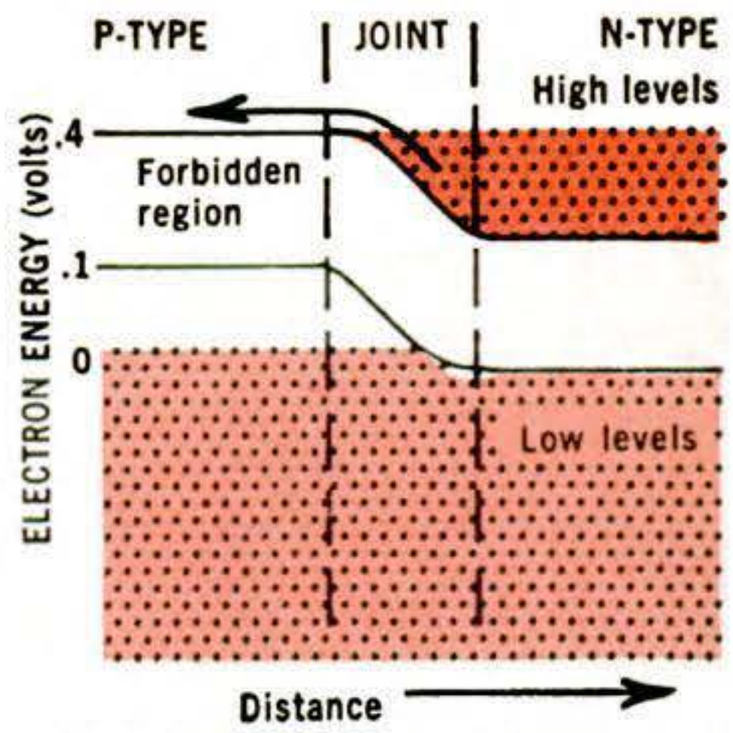


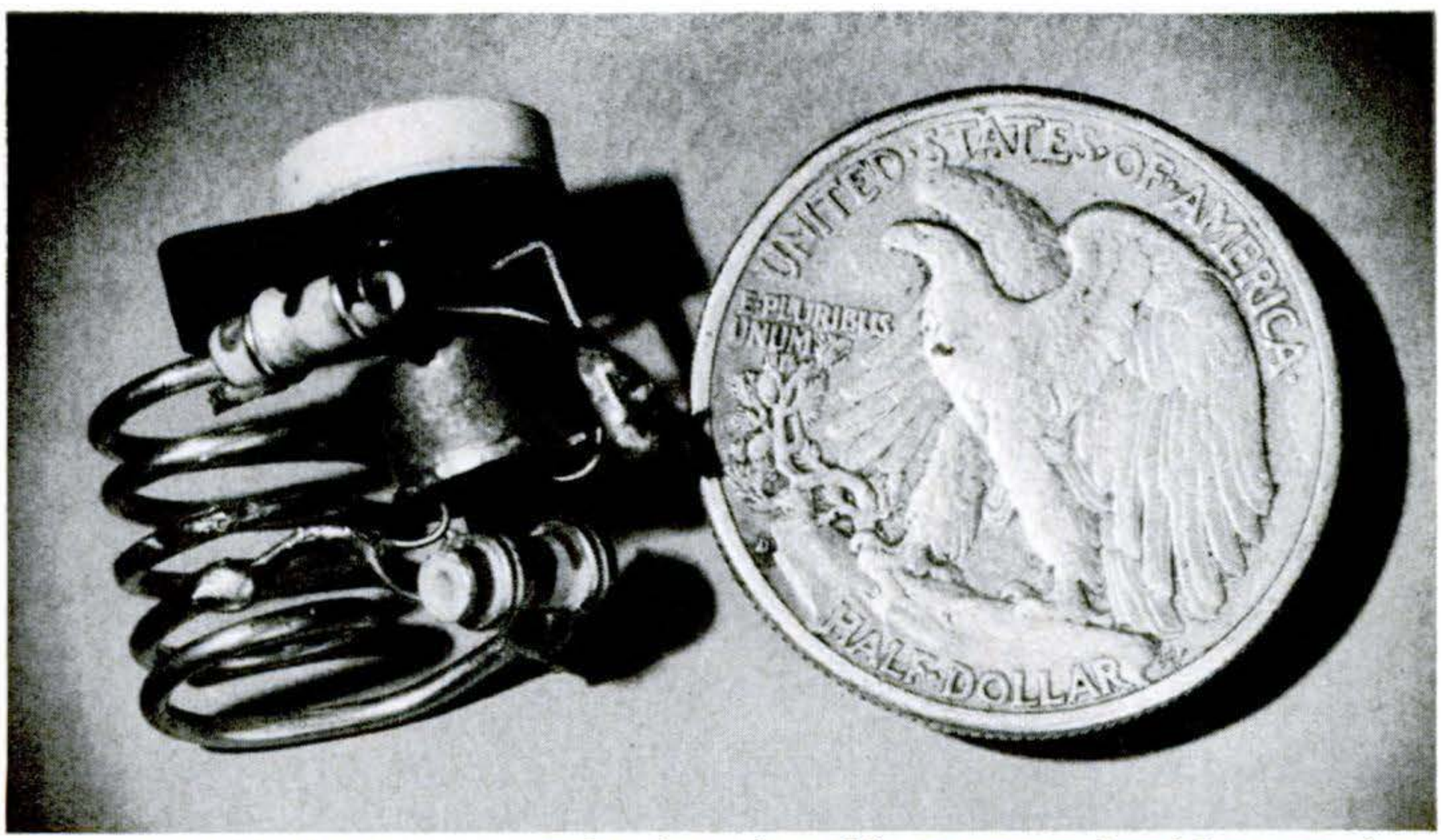
2. SMALL VOLTAGE. Energies of electrons on n-type side are raised by increase in voltage, bringing them opposite empty spaces in the p-type low levels. More electrons tunnel from right to left (n-type to p-type) than go the other way. A strong net current flows from right to left. At this point, current is increasing with increasing voltage —just as it does ordinarily in a wire—and the tunnel diode doesn't amplify any more than a copper wire would.



3. GREATER VOLTAGE. Energies of electrons on n-type side are raised still more. Some now face Forbidden Region of p-type. Those electrons cannot enter p-type because they can't exist in a Forbidden Region. So the current from right to left decreases. A steady "bias" voltage will keep the electrons in this range of energies, where the addition of small signal voltages causes sharp drops in current, and the diode works as an amplifier to magnify the signals.



4. HIGH VOLTAGE. Energies of electrons on n-type side are raised above the p-type's Forbidden Region. They now face the p-type's higher levels and can flow into the p-type again. Current flow from right to left goes up once more. Here increasing voltage increases current, and the diode is no longer useful as an amplifier. Because the tunnel diode works only over a narrow range of voltage, special radio and TV circuits must be designed for it.



THIS IS A RADIO TRANSMITTER, complete for broadcasting. The tunnel diode is in the can in the middle. Experimental model was one of several radical devices demonstrated by GE.

UHF television. Tubes run three to 10 times noisier, and transistors aren't even in the same league. Only two quieter amplifiers have ever been invented; both gobble power hungrily and one (the maser) requires a lab full of magnets and liquid helium (at 454 degrees below zero).

There are a couple of other things, too, that have some million-dollar spenders

[*Continued on page 266*]

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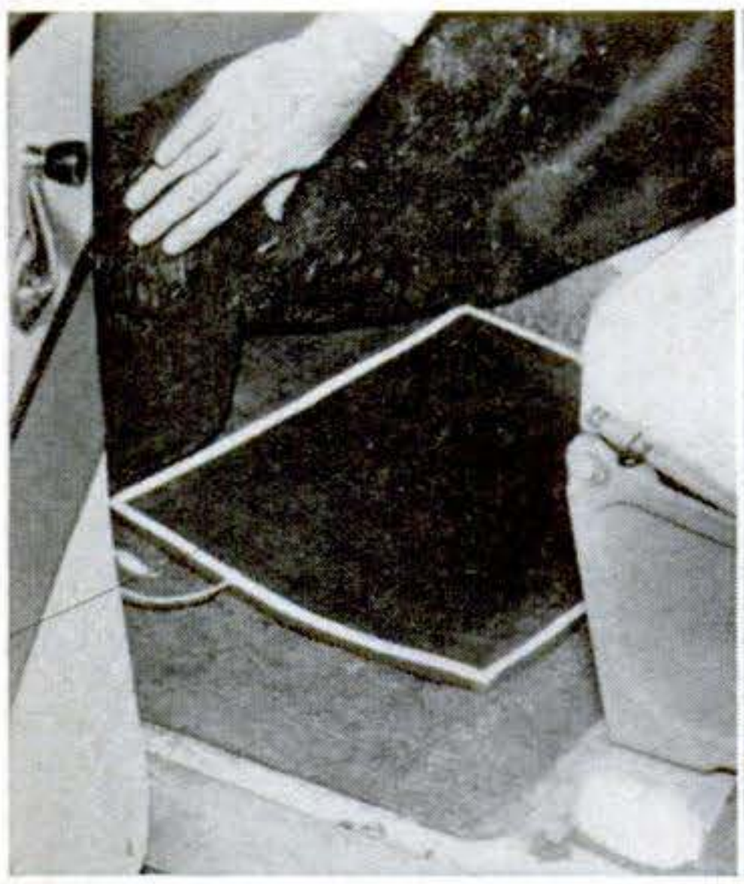
WHAT'S NEW

Rain Caps Protect New Lamp

Rubber caps covering pushbutton switches make this marine and utility lantern weatherproof. It has a 4½″ sealed-beam headlamp that swings vertically in a 90-degree arc and is said to be visible for one mile. A separate, flashing, red warning beacon, also sealed against moisture, is adjustable on a lever arm.

The lamp is powered by a new replaceable six-volt Eveready battery. It sells complete for $9.95, or $7.50 without flasher. Batteries cost $2.45. National Carbon Co., 30 E. 42d St., NYC.



FOOT WARMER on floor provides heat for your passengers in the rear seat. The heating element, protected by neoprene, works off the ignition like a car radio, gives off 160 degrees on a 12-volt battery. Set of two, $19.95. Warm-Flor Div., Box 4331, Hamden, Conn.

ANGLE BRACE lets you bore holes in close quarters. A flattened side on the head permits use on perpendicular surfaces. A knurled ring between the head and ratchet turns by hand to start the bit. $12. Millers Falls Co., 57 Wells St., Greenfield, Mass.

CARTRIDGE TAPE plays continuously without rewind or reversing. It's a Fidelipac, shown here being slipped into a slot in a Fidelivox player with built-in speaker. Magazine with two hours' recorded music $29.95, player $179.95. Waters Conley Co., Skokie, Ill.

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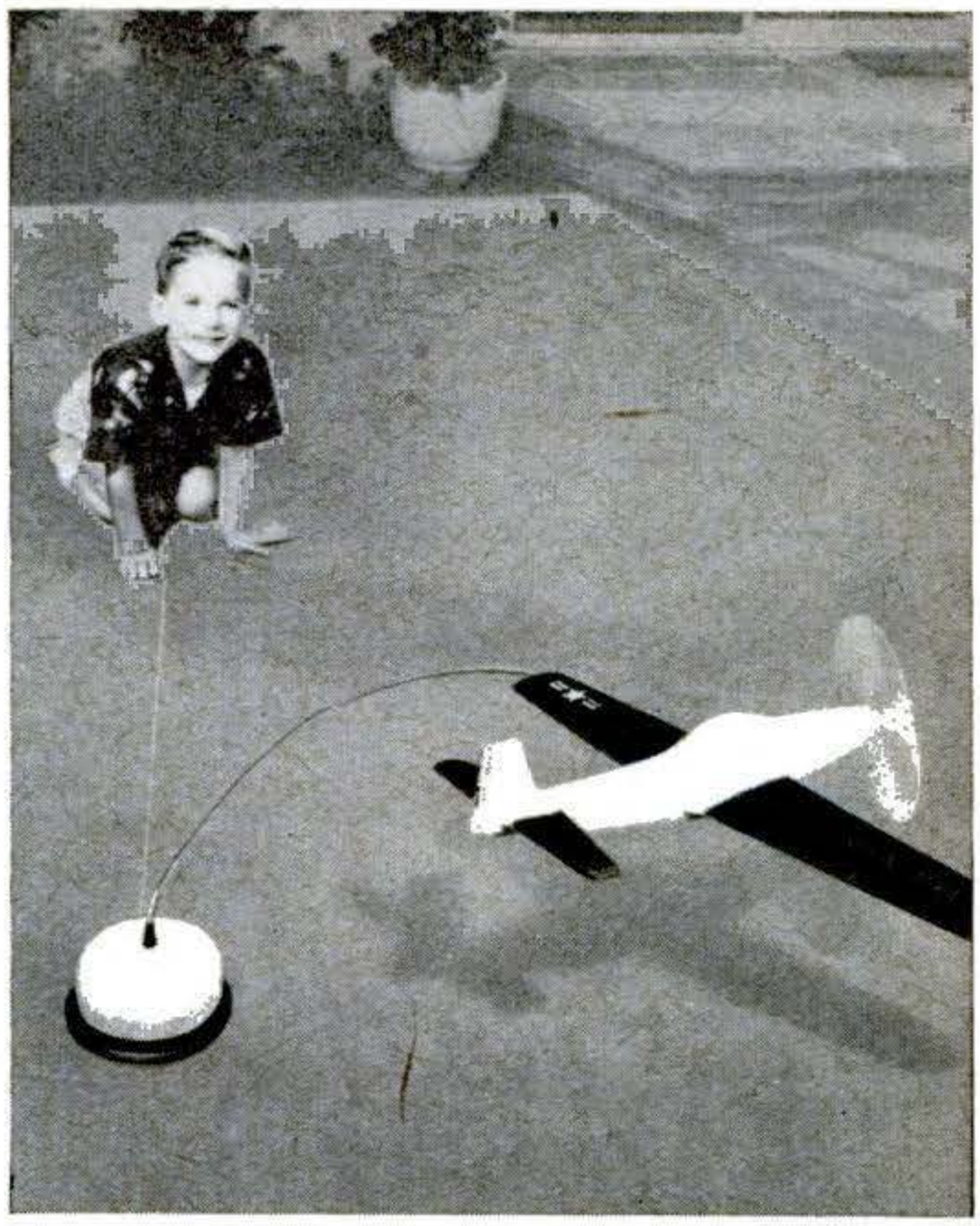
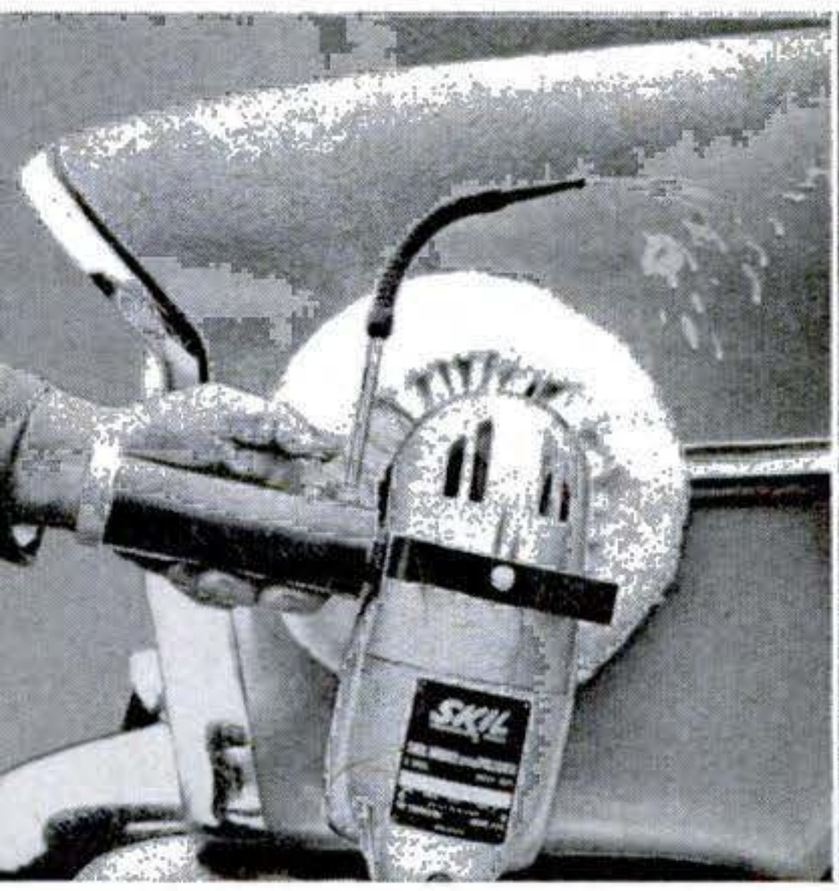
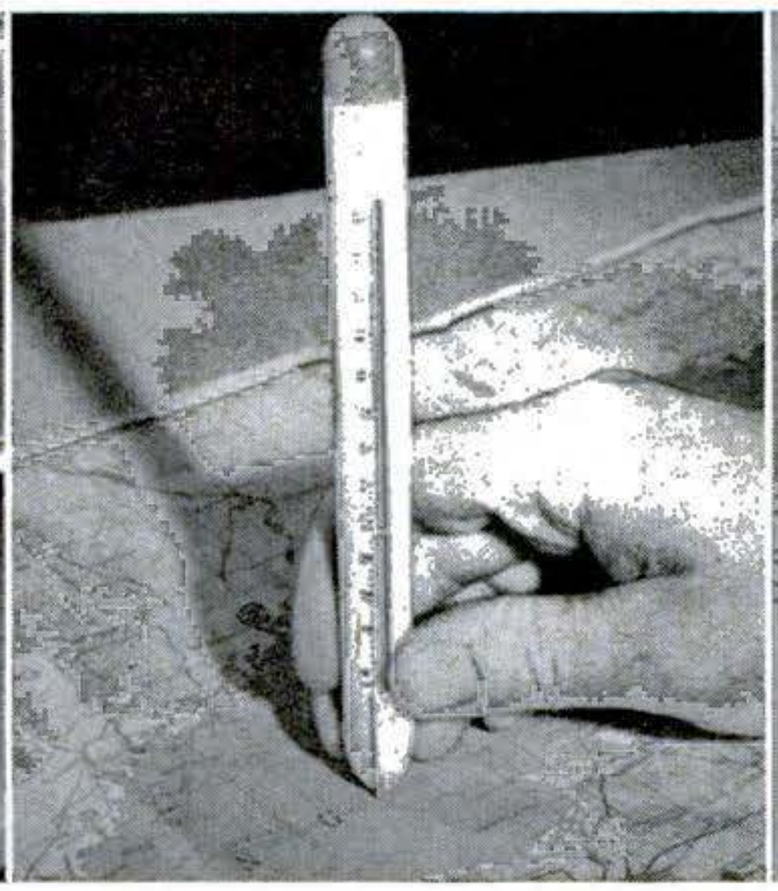
INTERLOCKING FLOOR TILE can be installed without adhesive. When laid wall to wall it can't slip or shift. Tiles are 1/8″ rubber in 9″ squares, have dovetailed slotted edges that lock firmly when put in place. They are called Rubberlock, come in 12 marbleized colors. Sears, Roebuck, Chicago, sells them.



TETHERED PLANE runs on four flashlight batteries. Made by a flying-model company, it gets off the ground but not far enough to bang into furniture if used indoors. Warmup, taxi, takeoff and racing speeds are controlled remotely. About $6, less batteries. WenMac Corp., 11511 Tennessee Ave., Los Angeles.



QUICK SHINE can be put on your car with a new electric polisher. A thumb-triggered pump squirts fluid ahead of a spinning buffer. Liquid polish is contained in a dispensing handle said to hold enough to finish an entire car. Skil Corp., 5033 Elston Ave., Chicago.



BOAT MILEAGE is measured in kilometers and nautical and statute miles by this device. Set it to the scale of your chart and push its toothed wheel along your course. A line on the scale marks total distance. About $2. Map-O-Graph, Inc., Valley Stream, N.Y.

LIGHTER needs no fuel, flint, wick or battery. Just plug the attached 6′ cord into any wall outlet, push a button, and you have an instant light for your cigarette. It operates on 115-volt AC or DC. About $2. Louell Products Co., 246 Fifth Ave., NYC.

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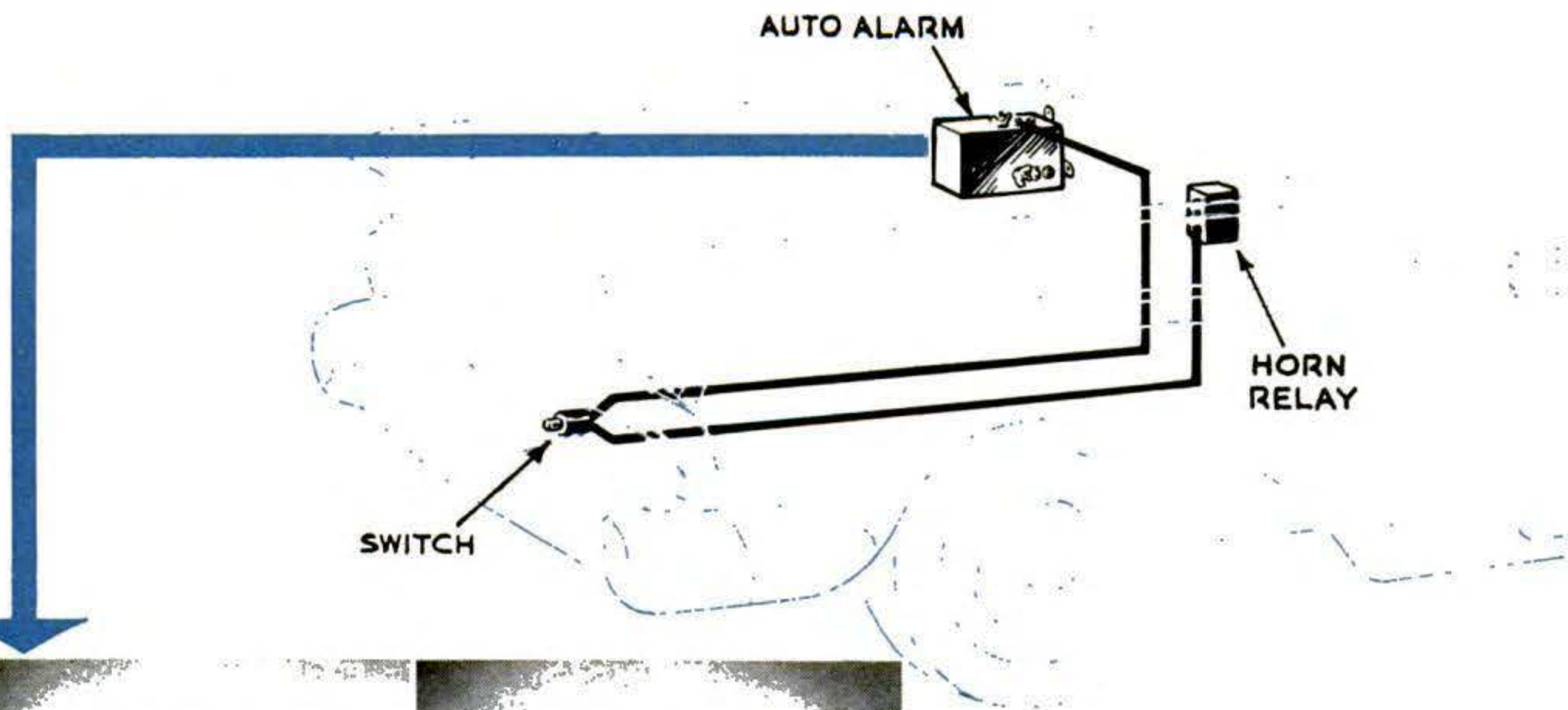
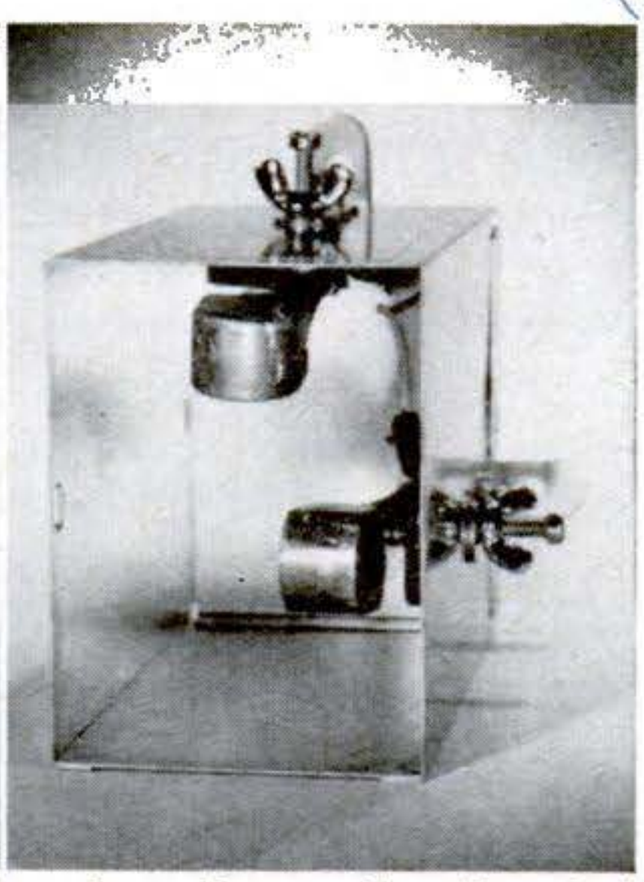




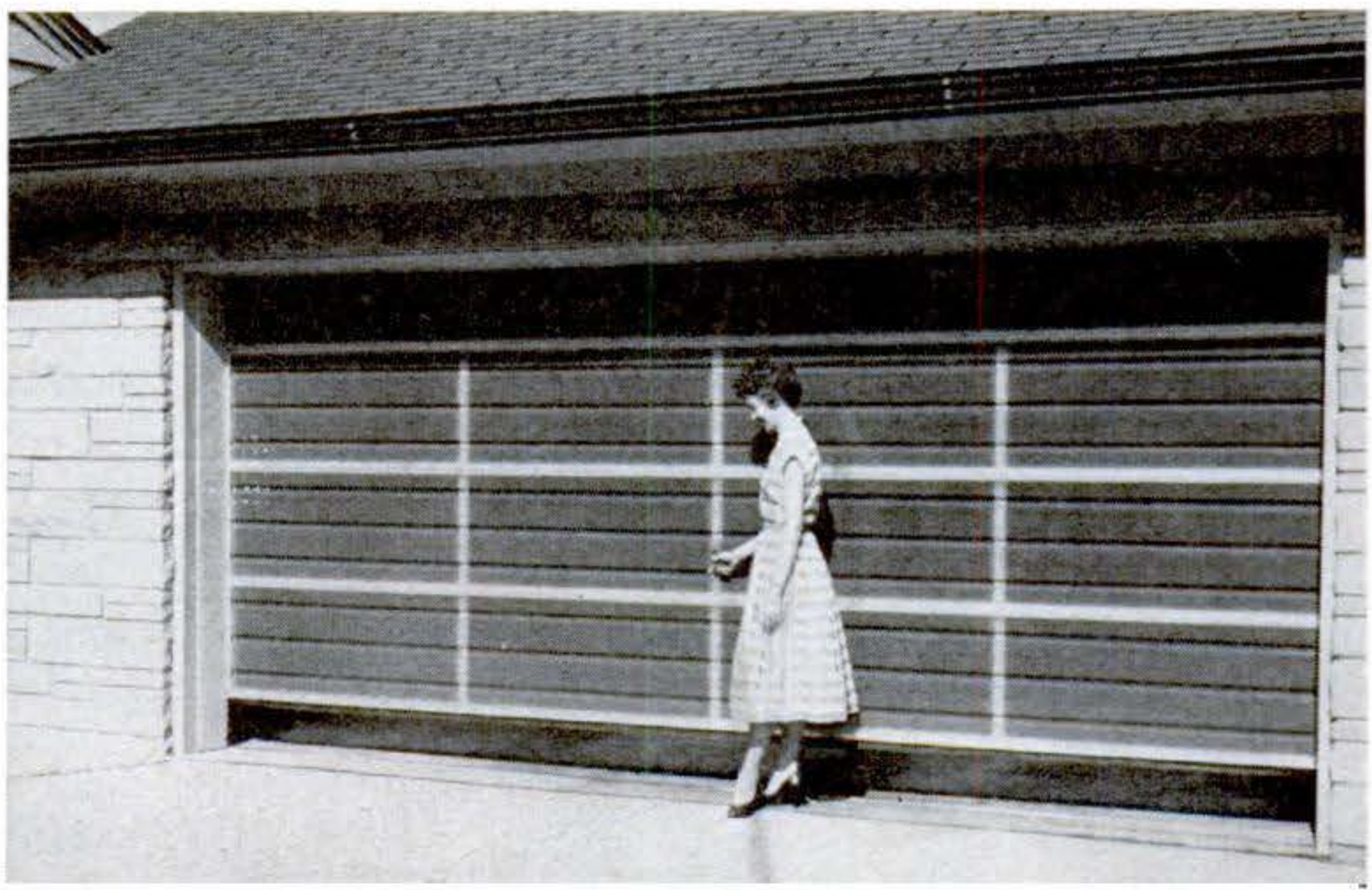
DOUBLE VIBRATORS inside the alarm box make electrical contact in the horn circuit with even the slightest jar. Intermittent blasts of the horn call attention to anyone trying to force open a car window or door.

Theft Alarm Blows Horn

Here's a new police alarm that blows the horn on an auto thief. It's attached to the firewall by screws. Hookup with the horn circuit is shown in the drawing. You flip a toggle switch when you leave the car, to set the alarm for the entire time you are away. An ignition-key attachment is also available. About $15. Warfield, 630 Stanley Ave., Brooklyn, N.Y.

GARAGE DOOR is made of fiberglass on an aluminum frame. The lightweight hinged sections ride smoothly on overhead rails to open or close easily.

Fiberglass panels are translucent, admitting soft daylight. Finished doors come in 10 sizes to fit either single- or double-width openings. Frantz Mfg. Co., Sterling, Ill.



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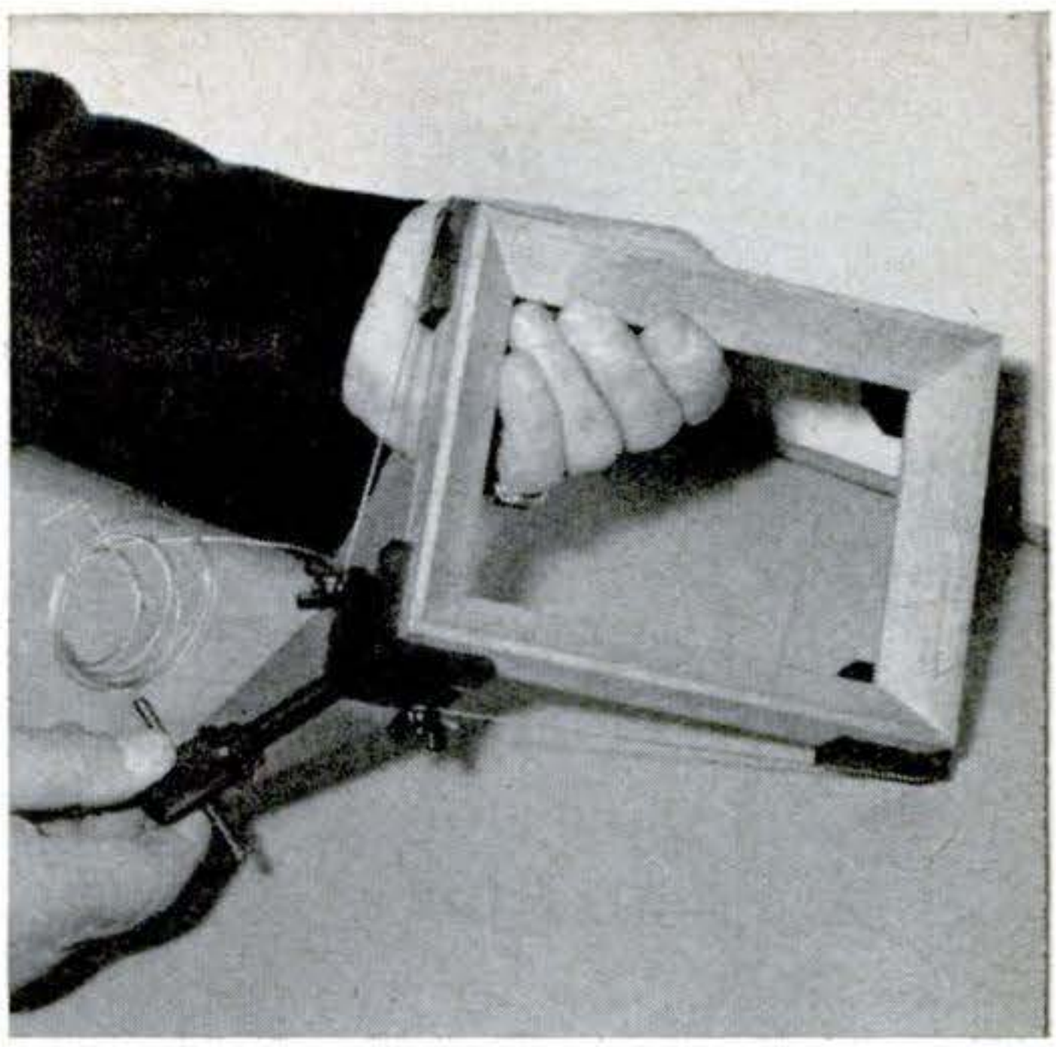
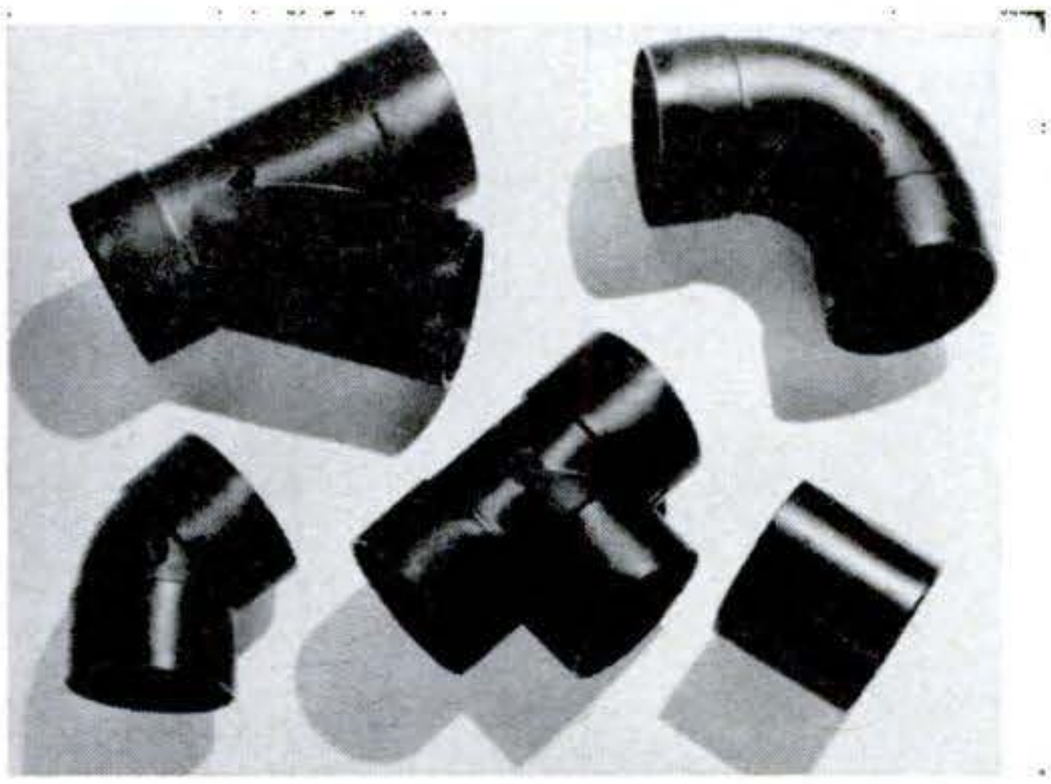
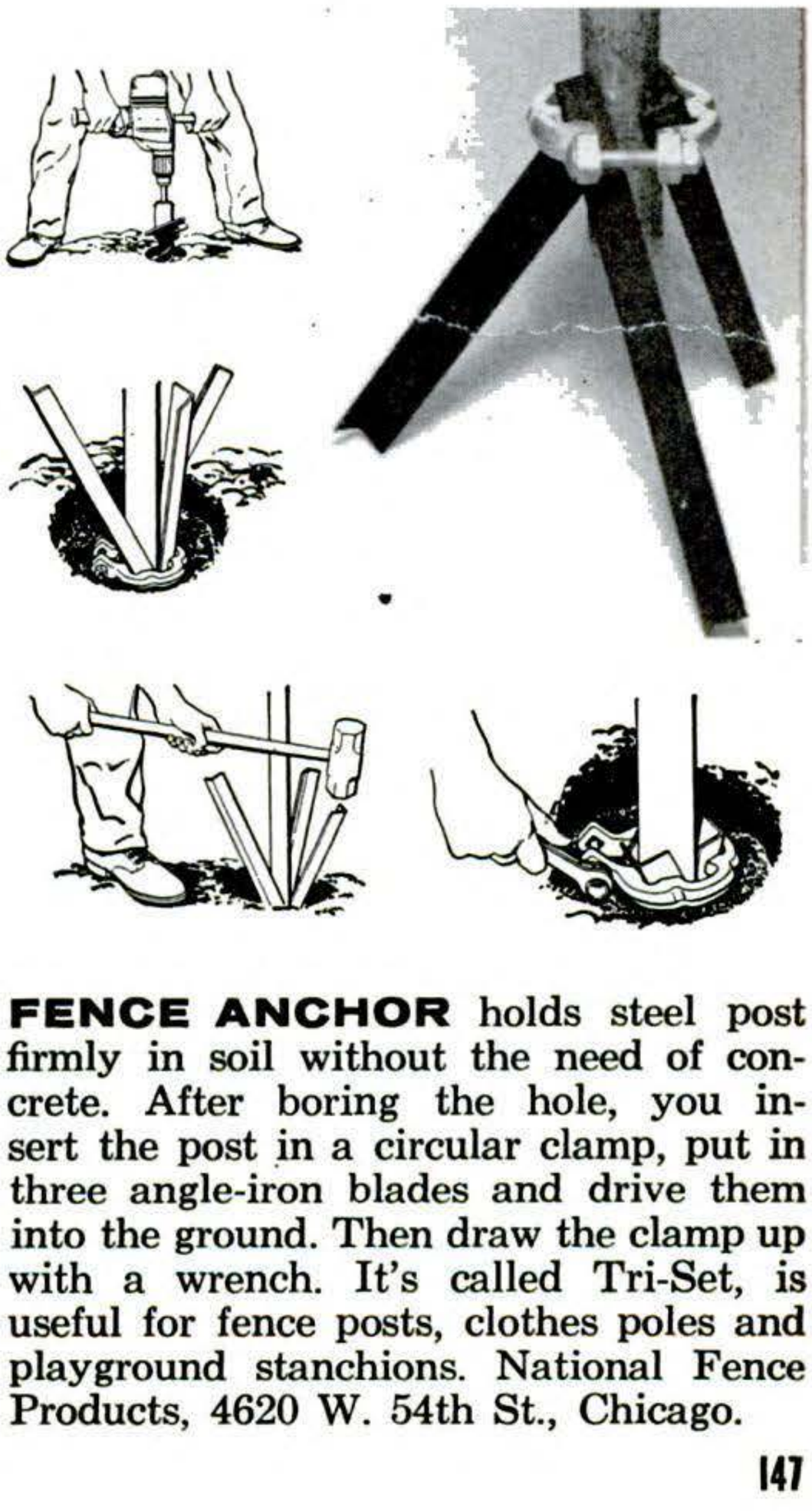
PILLOW SPEAKER carries TV sound to your ear, lets you see favorite programs without disturbing others. A 16′ cord plugs into a jack supplied with the kit. About $10. Watson Products Co., 5517 Wedgwood, Fort Worth, Tex.



CORNER CLAMP secures all four sides for gluing. British Elwood Cramp consists of clamp, three corners and a tightening wire for picture frames, cabinets and other pieces. Associated Merchandising, 1440 Broadway, NYC.



PLASTIC FITTINGS simplify installation of plastic sewer and drain pipes for do-it-yourself plumbers. Four-inch fittings come in T's, Y's and elbows. Carlon Products Corp., Aurora, Ohio.



FENCE ANCHOR holds steel post firmly in soil without the need of concrete. After boring the hole, you insert the post in a circular clamp, put in three angle-iron blades and drive them into the ground. Then draw the clamp up with a wrench. It's called Tri-Set, is useful for fence posts, clothes poles and playground stanchions. National Fence Products, 4620 W. 54th St., Chicago.

NUT OPENER splits open and easily removes a frozen nut without damaging the bolt threads. You fit it over the nut and screw the steel cutter up tight. Burroughs Tool & Equipment Corp., Kalamazoo, Mich.

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1. Old church, foreground, stands next to new.

2. It starts its journey behind a wrecker.

CHURCH MOVES BY LAND AND SEA

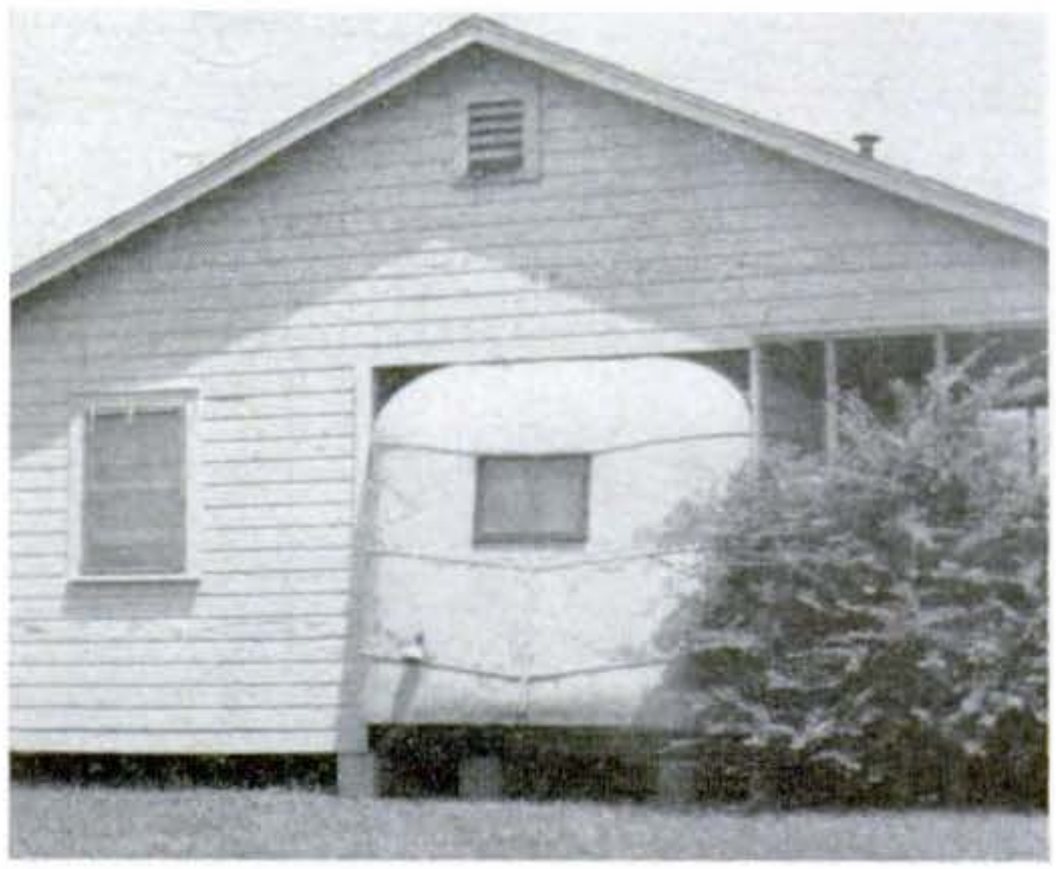
The 70-member Episcopal mission at Satellite Beach, Fla., just south of the Cape Canaveral missile base, has a new church. It's an outgrown edifice, the gift of St. Andrew's parish at Fort Pierce.

The 58-year-old structure was jacked up and hauled to the Indian River, part of the Intracoastal Waterway, loaded on a barge and towed 70 miles upstream. The photos above and at right show how the job was done.

The building is 70 feet long, 24 feet wide, weighs 30 tons. The largest load ever towed on the Indian River, it was navigated through five drawbridges. It fought tides and strong channel currents without mishap. After the water journey, which took 23 hours, it had to cross 500 yards of beach.

The old-new church is considered a real bargain. Transportation and moving expenses totaled $5,000. It would have cost $35,000 to build new. And the structure has the distinction of becoming overnight the oldest and most historic building in a year-old town.

ANTIAIRCRAFT BAZOOKA. Here is a guided missile that is fired from a foxhole. It's the Convair Red-Eye, guided by heat of a strafing plane's engine. Its launcher, resembling a World War II bazooka, is held on a GI's shoulder.



TRAILER HOUSE. M. M. Hendrix likes the kitchen in his trailer. So he built his home in Parkin, Ark., to fit around it. When he's home, he uses the trailer kitchen and living room. To take a trip, he hitches it to a car and pulls out.

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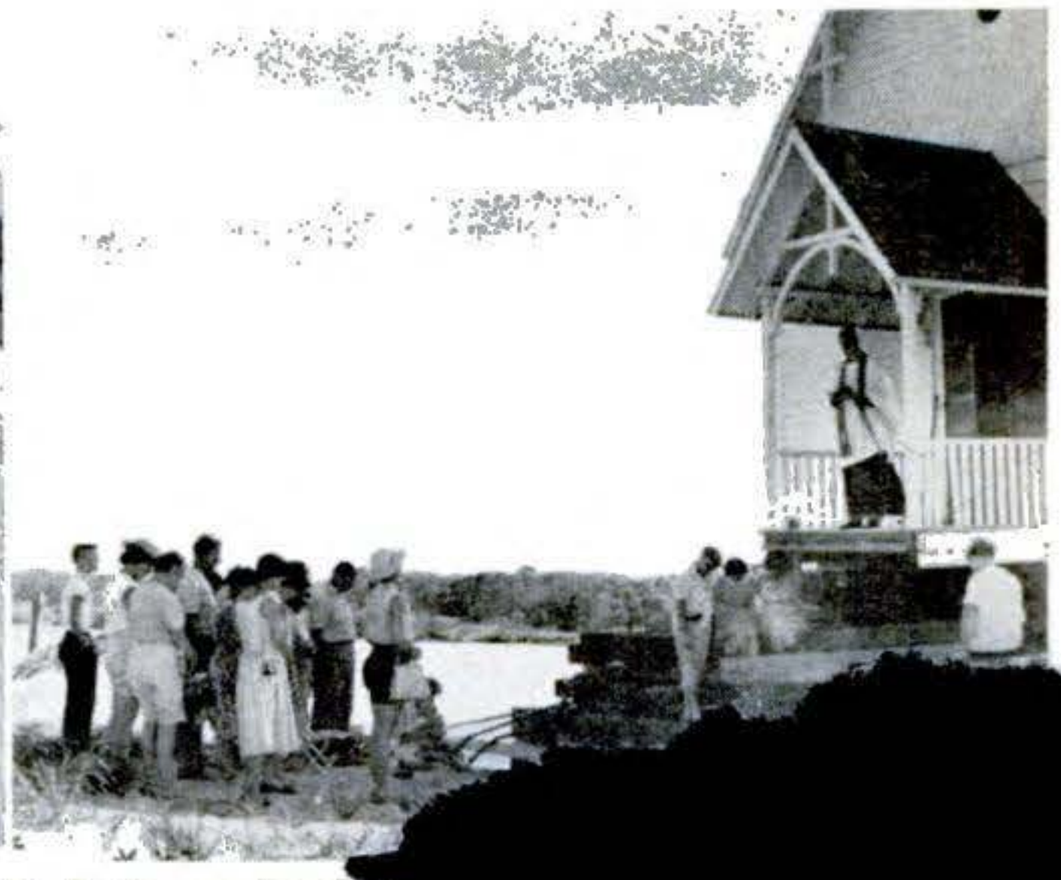
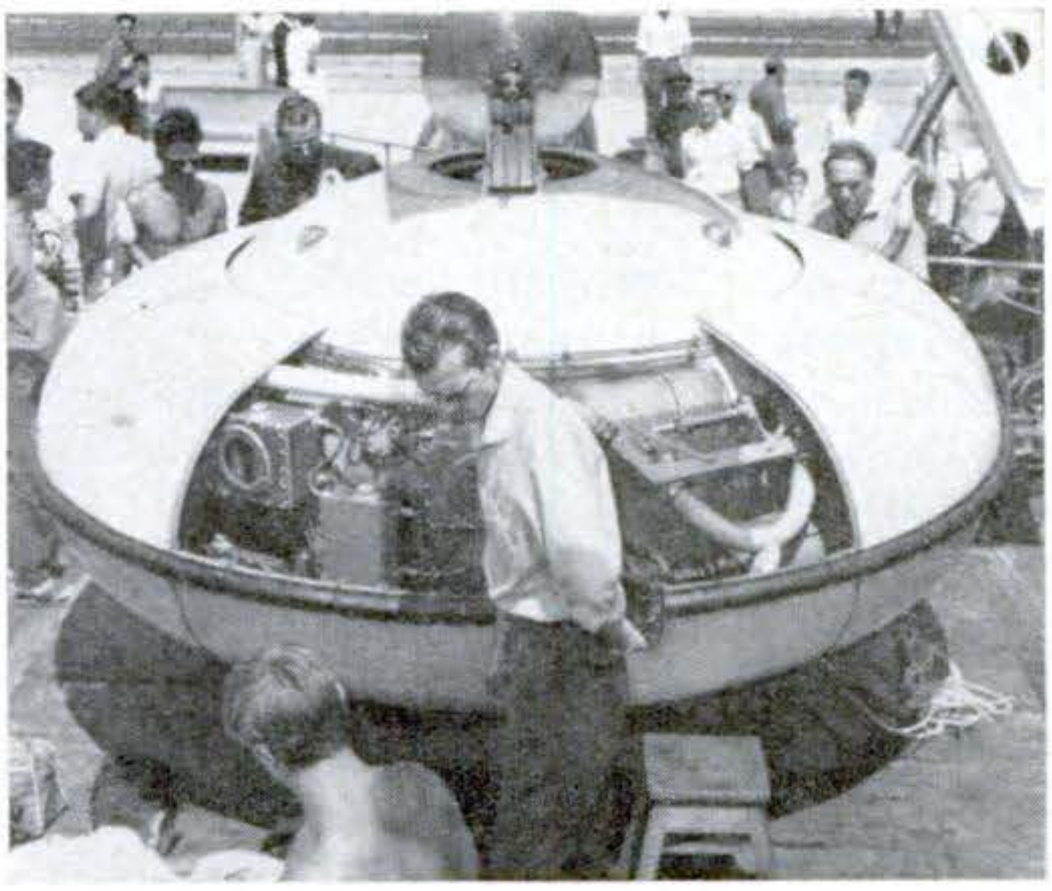
3. Ticklish part of the moving job was getting church over the Fort Pierce seawall to the barge.

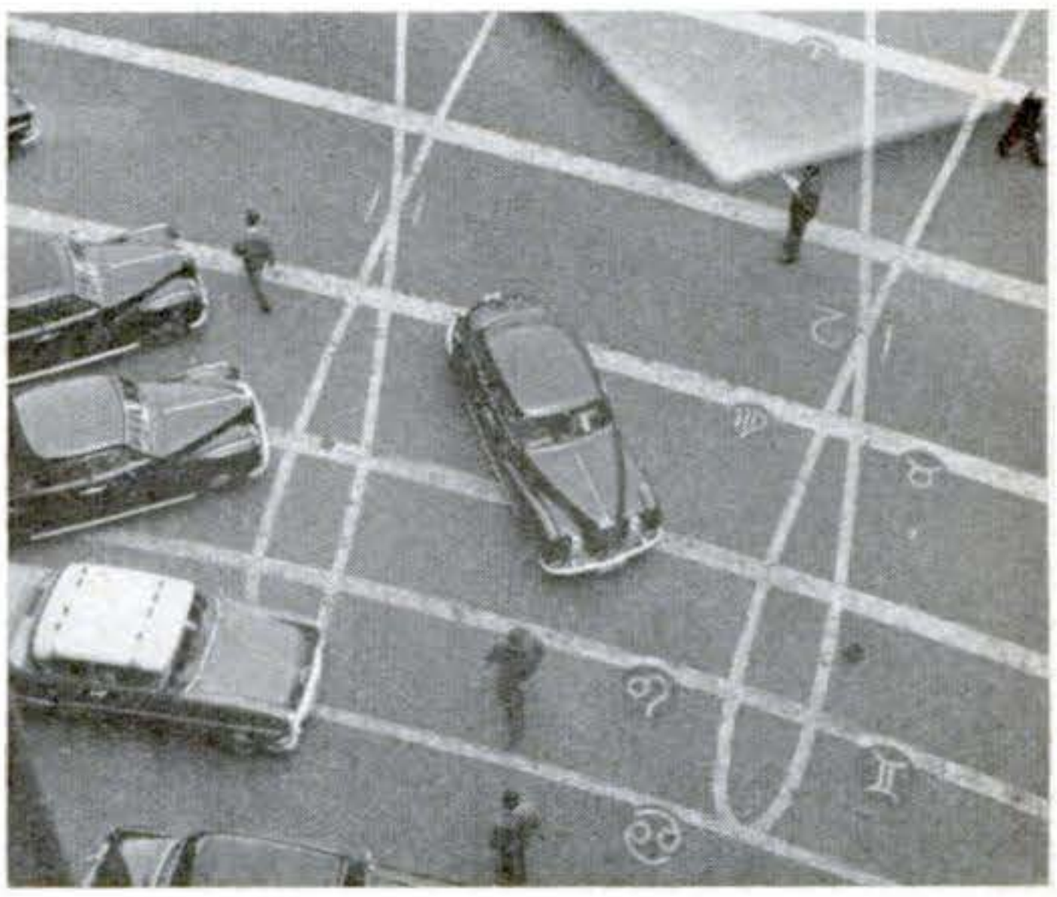
4. Away it goes—floating up the Indian River.



5. Safe on land:



DIVING SAUCER. The Denise, shown here, is a new kind of vehicle for underwater research. Its French inventors designed it to reach ocean depths to 1,000 feet. They say it is capable of staying down for six hours at a time.



PARKING OVER TIME. A sun dial in the yard of the West German patent office in Munich is big enough to park cars on. Time and zodiac lines are white cobblestones. Curves adjust the sun's path to time of year. Time shown: 11:40.

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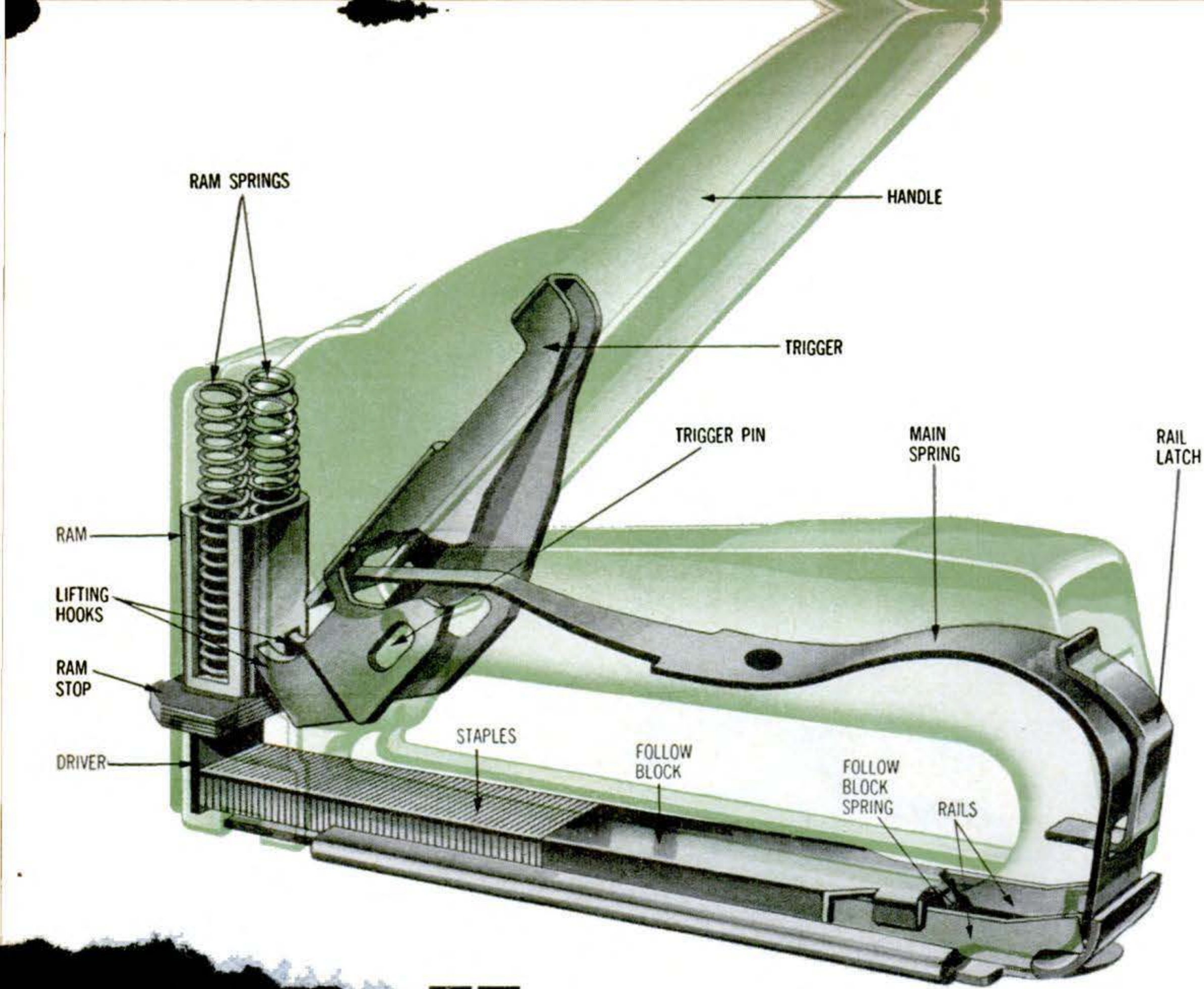

How a Stapling Gun Works

A STAPLING gun is like a tiny pile driver that whams in two-legged nails. Squeeze the Swingline tacker described here, for example, and the driver gives the staple a 200-pound wallop. Though it moves only a half-inch, the driver reaches a speed of 36 m.p.h.

Regardless of size, a staple needs to penetrate about 1/4" into wood to hold. Longer legs simply allow you to fasten thicker material; penetration's the same.

You can drive about 250,000 staples with the gun shown here—if you hold it firmly against the wood or other material. Then most of the driving force is absorbed by the staple. But playfully firing the gun in air causes the blow to land entirely on the ram stop, which can stand only about 25,000 such blows.

Six sizes of staples are commonly sold for home use: 3/16", 1/4", 5/16", 3/8", 1/2" and 9/16". Most popular of these is the 5/16", the size recommended for fastening batt-type insulation to studs and rafters. The three smallest sizes are made of low-carbon steel, while the three largest come in both low- and high-carbon steel. They are stuck together with acetone cement. Most have a rust-resistant finish.

They've been using stapling guns in industry for about 30 years, but the home handyman discovered them only a short time ago. Now over 6,000,000 are in use. —*Erik H. Arctander.*

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When you squeeze the handle

1 **THE TRIGGER PIVOTS.** As the handle forces one end of the trigger down, lifting hooks on the other end push the ram upward. This compresses a pair of ram springs. In the base, another spring pulls the follow block against the staples to hold them tightly in place.

2 **NEAR END OF STROKE,** ram springs are fully compressed. The trigger is now almost horizontal and slides backward slightly on the trigger pin.

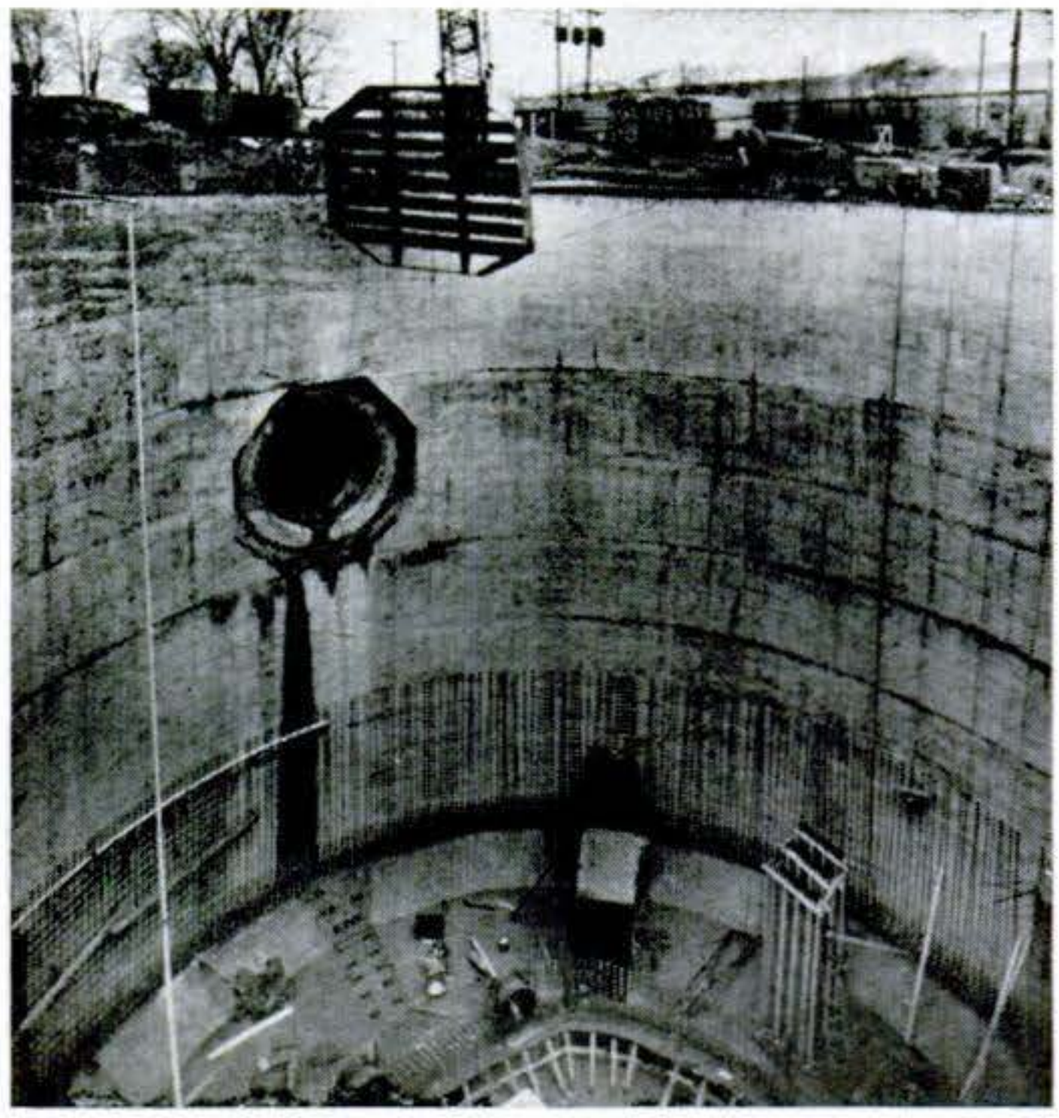
3 **HOOKS SLIP OUT** of the slots and release the ram. Expanding powerfully, the ram springs propel the ram downward. Driver attached to the front of the ram hits a staple squarely on top, forcing it into the material being fastened. Stop takes up excess energy.

When you release the handle

4 **TRIGGER PIVOTS BACK** to rest position. Energy for return movement comes from tension on the front end of the main spring, which was forced upward by the trigger's downstroke. Trigger slides forward on pivot pin; hooks engage slots.

When the wind begins to blow, this movie actor tries to make it over to a waiting car . . .

SCISSORS LIFT. The hydraulic hoist above loads cargo on big planes at Frankfurt, West Germany. It can lift 3½ tons as high as 12 feet. It is self-propelled, can be driven right up to a plane and quickly raised to cargo-door height.



BIG-CITY WELL. A billion gallons a day will flow through this waterhole. The caisson—90 feet deep, 90 across—is part of a new Detroit booster station. The 100-ton baffle being lowered into place reduces turbulence from the intake.

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MOVIE DIRECTOR BLOWS UP A STORM

When the script of a new French movie, "Picnic on the Grass," called for a big wind storm, director Jean Renoir (son of the famous painter) didn't wait for one to blow up. He had mechanics erect a big fan on the set. It had four-foot propeller blades, capable of creating air currents of 60 m.p.h.

This sequence taken from the film shows some of the results. The wind blew one actor completely off his feet and almost took the door off the car. Purists say mistrals are more violent than the one depicted in the film. But 60 m.p.h. was hard enough for this actor.

MISTRAL MACHINE that made the big wind is this fan, which can blow at 60 m.p.h.

. . . but is blown back from the door . . .

. . . and finally lands on the ground.

PACKAGED FOR SPEED. Here's a sling that pays out battlefield lines at 100 m.p.h.—five times faster than normal. It was designed by the Army for a new, light telephone cable that handles 96 two-way conversations at the same time.

OFFSHORE OIL. This buoy unloads tankers off Stockholm, Sweden. It's an inlet for submerged pipelines that carry oil to shore. Unloading ships can swing all the way around it. The system takes the place of docks and harbor facilities.

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Rusted parts frozen together? No sweat. You'll find all the answers here

How to Loosen

By Walter E. Burton

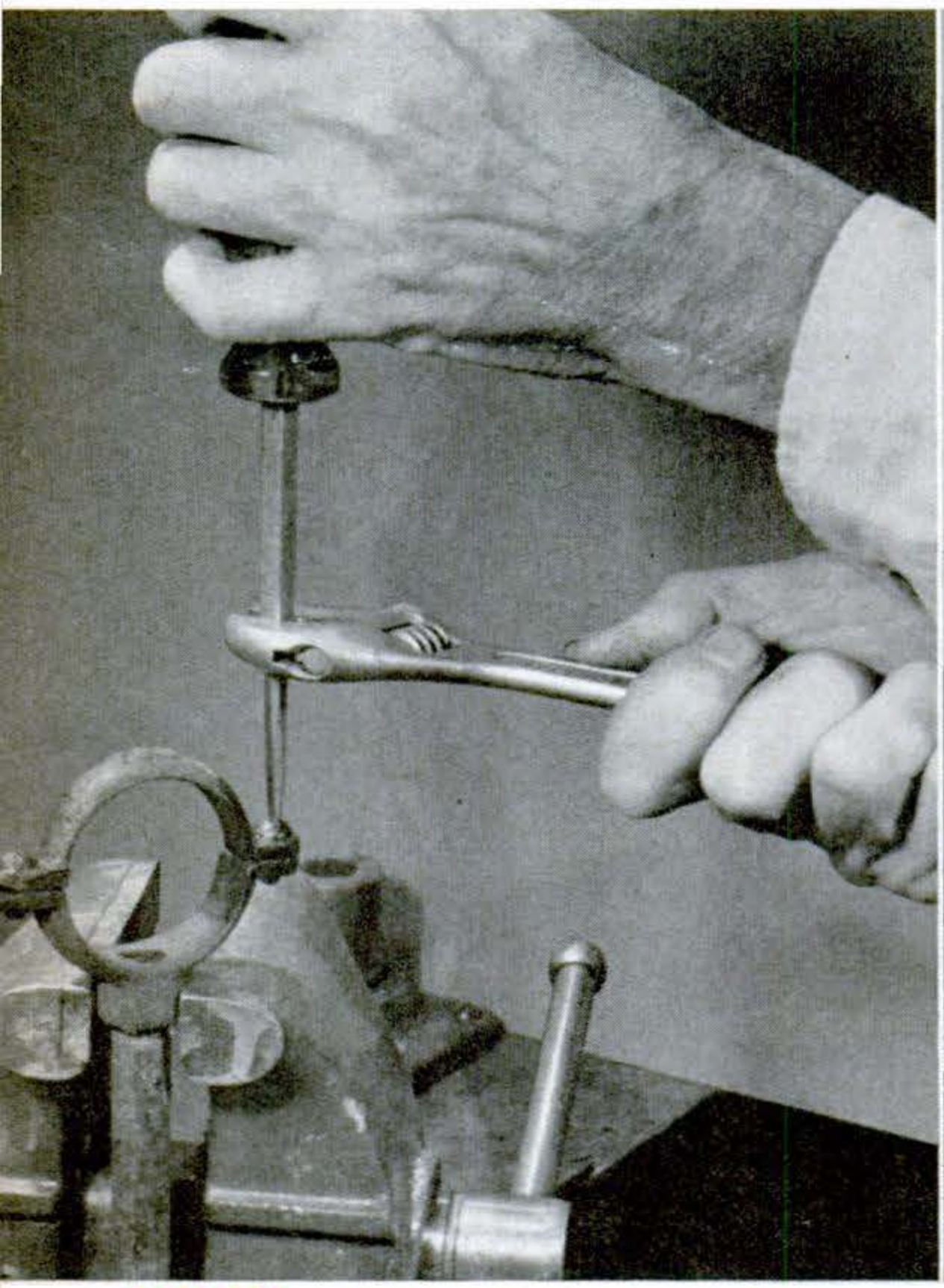
GOT a fitting that's grown fast to its pipe, or a nut rusted tightly on the bolt? Or maybe a wood screw has corroded so it won't budge, or corrosion has united two normally moving parts. Then it's time to try some unfreezing tricks.

The typical rust-frozen joint can look wholly innocent from the outside. A fitting and adjoining pipe can appear clean or only slightly rusted. It may even sport a sound coat of paint, and the visible portion of the thread may look unaffected. But if you could peer between the threads, you would find a dense film of rust that fills every space like an efficient cement—which it is. Before you can hope to separate such a joint, you must destroy that rust film's grip.

Force. Sometimes brute strength, achieved by some simple force-multiplying stunt, is enough to break rust's hold.

To boost the ability of a screwdriver, use a wrench as a lever. Set its jaws over

Singly or combined, these four basic methods will



FORCE Increasing torque with extra leverage is often enough to break the cementing action of rust. But use care; don't apply more force than the tool can safely take. Discretion is also required to keep from breaking or ruining the part you're trying to free.

VIBRATION To start the parting action, a few sharp jolts are more effective than steady leverage. When working with parts that may be damaged, use a hammer with a soft metal or plastic head. Or cushion the parts with a piece of copper or brass.

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Rusted Metal Parts

the screwdriver's square or hex shank, or find a hexagonal or square spot on the ferrule of the handle. There are screwdrivers with built-in levers; and a screwdriving bit in a hand brace is one of the most persuasive screw turners. Always clean dirt and rust from the screw slot before trying any turning.

Vibration. Sometimes simply tapping (not whamming) a rusted part with a hammer will budge it. To prevent marring, use a relatively soft hammer—lead, brass or plastic; or interpose a sheet of aluminum, copper or brass between the work and an ordinary hammer.

Often a nut can be started by holding a punch against one of its flat sides. Hold it at a point where hammer blows on the punch will exert a turning action.

Chemical aids. During an expedition to a junk yard, I once found a rusty 10″ adjustable wrench whose movable jaw and adjusting nut were tightly locked. I added it to a collection of odds and ends, and went to the weighing platform. The man there picked up the wrench.

unfreeze the most stubborn rust bonds

CHEMICALS Commercial rust-looseners are a good bet. They contain combinations of such penetrants as kerosene, naphtha, carbon disulfide, oil of camphor, amyl acetate, cottonseed oil, carbon tetrachloride and light paraffin oil.

HEAT Here, to part two members, you're relying either on their unequal expansion under heat, or the disintegration by heat of what's locking them together. A few drops of light machine oil around a bolt or screw before you apply the heat may help.

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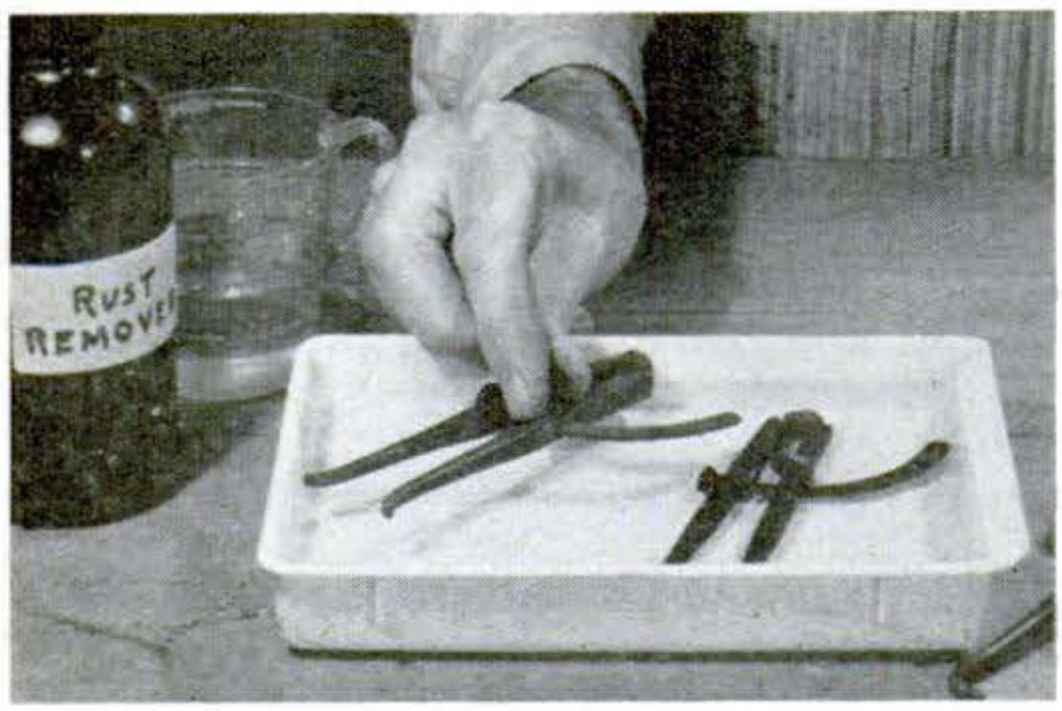
HEATING A FITTING RAPIDLY causes it to expand at a faster rate than the pipe to which it's threaded. Snugging the pipe in a vise close to the joint, as above, helps to keep it cool.

JEWELER'S TRICK for freeing rusted screws in clocks and watches also uses heat: First clean the screw head to improve heat transfer; then press a red-hot rod firmly against it.



COMMERCIAL RUST-REMOVING SOLUTIONS usually work fast. But in extreme cases you may have to immerse the parts in such penetrating oils for several hours, or even overnight.

"We don't usually sell junk tools," he said. "Our men recondition them."

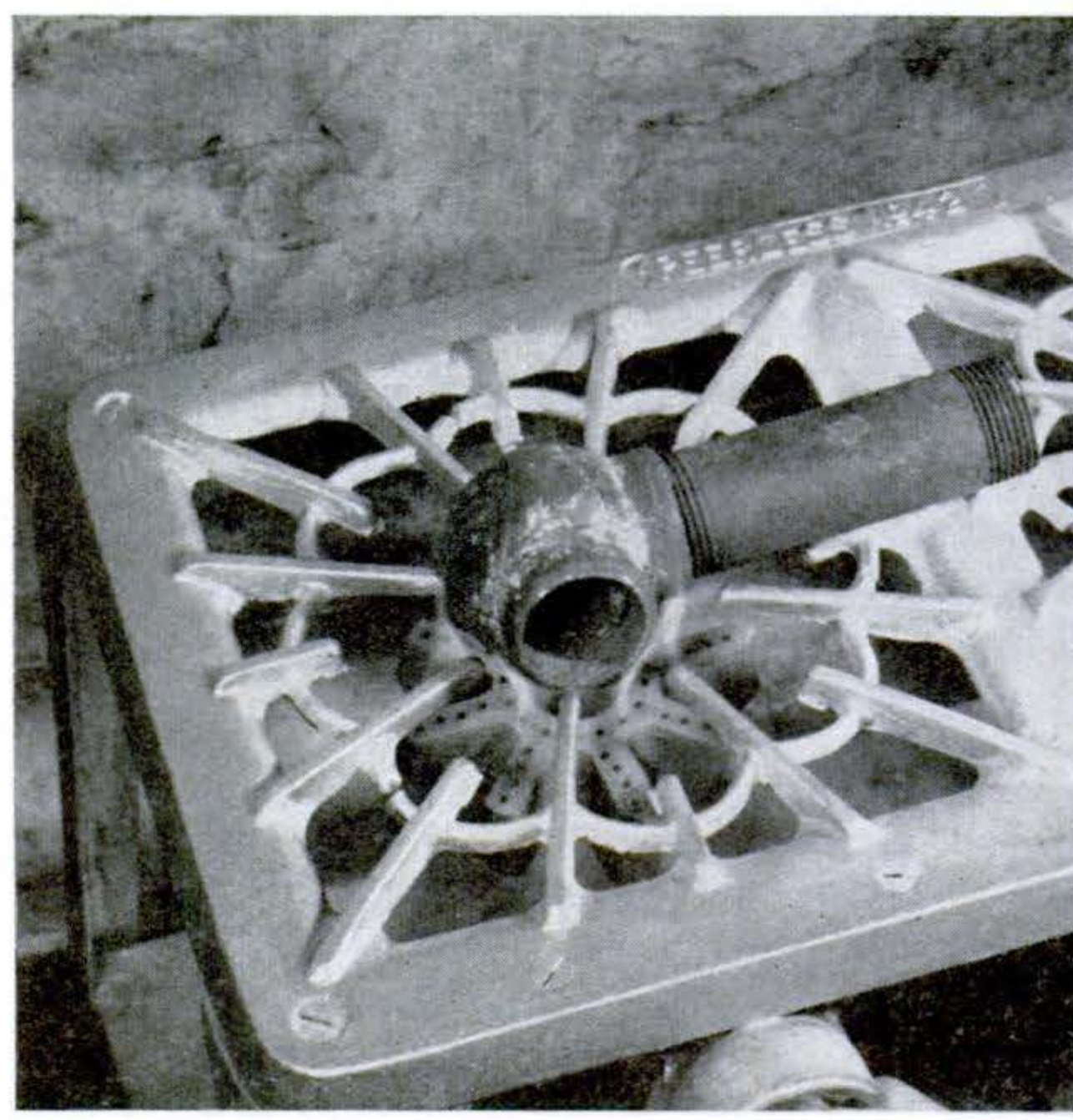
"That's okay," I told him. "I just wanted to tinker with it anyway."

The attendant looked at the wrench more critically. "This one's a goner," he said, and he tossed it on the scale, along with other nickel-a-pound parts.

I didn't bother to explain that I knew a trick that would make the wrench usable again. Chemical warfare! This simply meant putting some fluid to work that would break down the cementing power of corrosion and possibly add a lubricating action. Old standbys include kerosene, penetrating oil, denatured alcohol and ordinary lubricating oil.

You can also buy special "loosening" preparations which seem to have a remarkable ability to creep into rust-locked joints. Some of these work quite rapidly —often in seconds or minutes. Before squirting or brushing a penetrant on a rusted part, scrape off any surface scale that might interfere with its creeping in. After the loosening liquid has been applied, tapping the nut or other part with

The kitchen-stove treatment—



COOK THE JOINT directly above a gas burner. If the metal has been painted or for other reasons gives off fumes, be sure that the room is thoroughly ventilated. Let the work reach a temperature that leaves it just short of redness before removing it from the flame.

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a hammer may help speed the penetration and break the rust grip.

Another chemical stunt, the trick I used on the junk-yard wrench, may work when others fail. This is to soak the rusted article for some hours in a commercial rust remover. In addition to unfreezing parts, it will do away with surface rust. If the piece cannot be immersed, the affected parts can be kept wet by repeated applications of the remover. A typical solvent comes in liquid form and is diluted according to directions before use.

Heat. When other efforts fail, this may be the answer. Heating expands metal, cooling contracts it. The movement is especially effective when one rusted part of an assembly can be made to expand or contract at a different rate than an adjoining part. Heat alone may change the characteristics of the material binding the parts, thus loosening its grip.

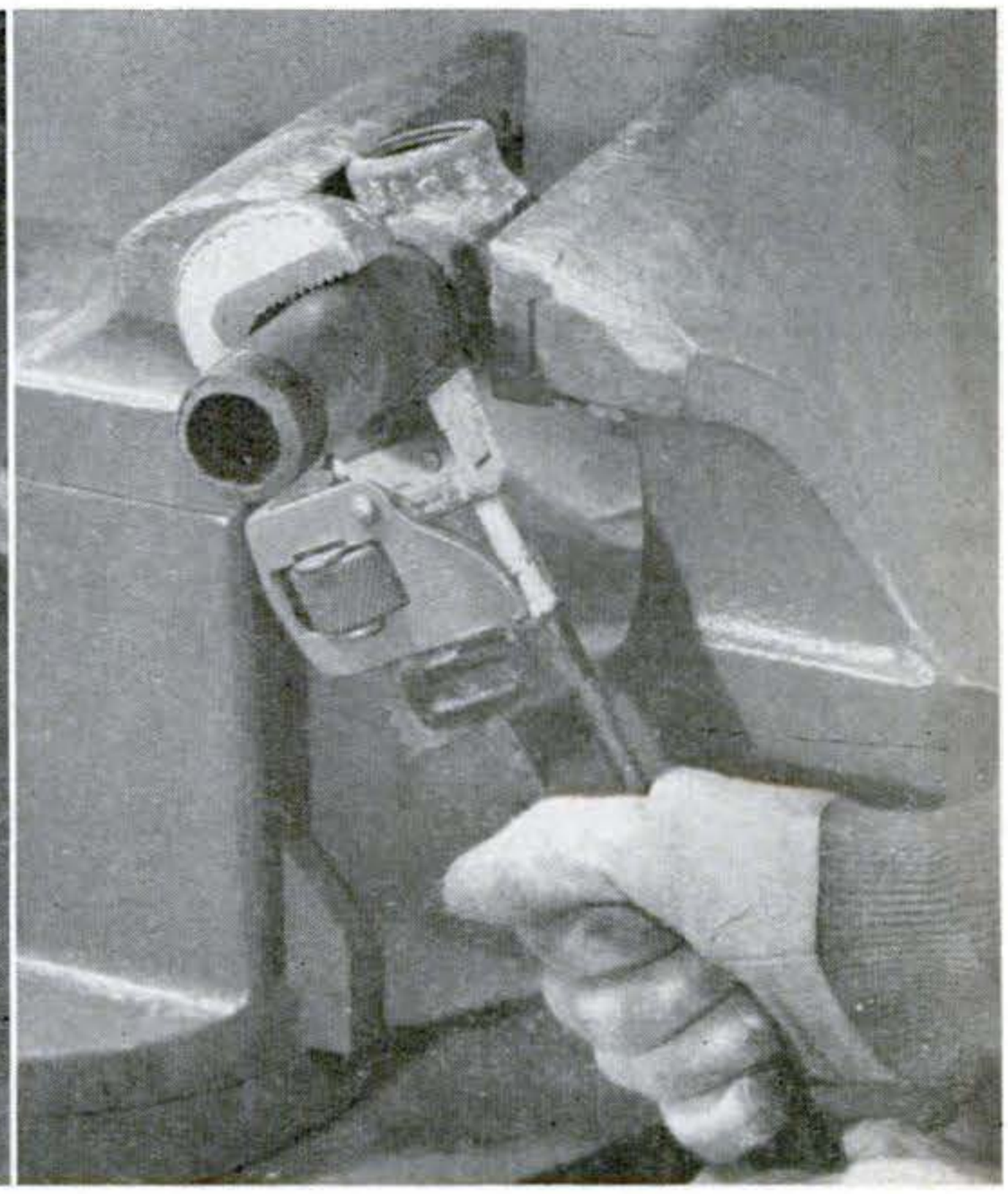
To loosen rusty bolts in metal, corroded wood screws, pins, and similar parts, apply heat to the exposed end. Thus, clock repairmen sometimes hold a red-hot iron rod against the end of a rusted screw for a minute or so before trying to turn it. A little light oil applied around the screw, before heating it, may help. And theoretically it should help if the fastener is made to shrink faster than the surrounding metal, as by applying ice or cold water to it for a few seconds, and immediately trying to turn it. Pressing the tip of a hot soldering iron against the head of a screw is a favorite trick.

Sometimes the shape of a rusted article is such that the outer part can be heated rapidly with a torch to make it expand faster than the inner part, and so break the rust bond. Thus a pipe fitting can be heated more rapidly than the pipe on which it is installed. When heating the part to a high temperature might cause damage, it's a good idea to cool the assembly in a freezer first. Then use warm or room-temperature water to expand the outer portion.

When heating will do no harm, the rusted assembly can be roasted for a while over a stove burner, sometimes even being heated to redness. This

a way to break rust locks that defy all other attempts

QUENCH THE INTERNAL MEMBER of the joint—a pipe nipple, in the example shown—in cold water. This causes it to pull away from the external part by contraction. Wear gloves and keep your hands and face well to the side of the water container to avoid steam burns.



WHILE IT'S STILL HOT, clamp the external part in a vise—or, in the case of small objects, continue to hold it with pliers—while you back out the internal part. A few drops of penetrating oil help in this operation; apply them before you put the heat on the work.

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alone may be enough to loosen the joint, often separating it before it cools. When construction and materials permit, the inner part of the rusted assembly—such as the pipe or nipple in a fitting—can be shrunk by dunking it in cold water.

Caution: When a hot pipe is quenched, steam and hot water may shoot out of the upper end with considerable force. Handle it accordingly. Do not use the quenching treatment on metal (such as cast iron) that rapid cooling might damage. Avoid heating steel that has been hardened and tempered, unless you plan to reharden it after the rust problem has been licked.

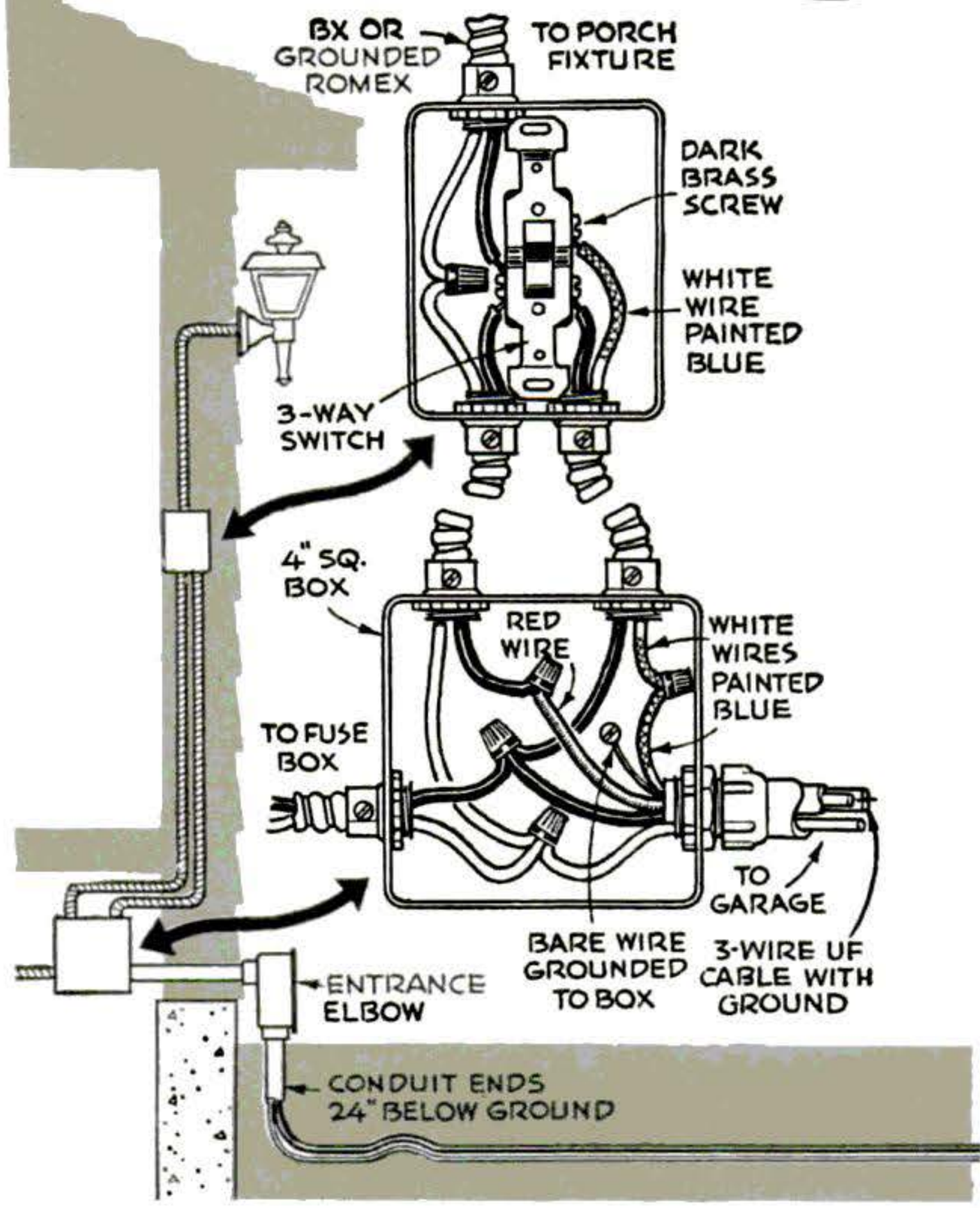
The works. In very stubborn cases you might try a combination of the foregoing treatments. I found this necessary for a badly rust-locked joint between a tee and a length of 1½″ pipe. Force wouldn't budge it. Two kinds of penetrant failed to unfreeze the threads. Then I heated the assembly for 20 minutes on a gas hotplate, clamped the tee in a vise while it was still hot and applied a long-handle wrench. The pipe section grudgingly moved a little. The rust seal had broken! But the turning was difficult; and so, now that the metal had cooled somewhat, some penetrant was squirted around the joint to ease the remainder of the operation.

Compound used in assembling pipe may cause joints to stick. Some penetrants soften such compounds. Another way is simply to heat the joint.

When rust-locked parts have been separated and cleaned, future trouble can be lessened by applying something to their surfaces that will discourage corrosion. Machine oil or cup grease should not be used on lines and fittings that carry fluids or gases that might react with them.

There are commercial rust-preventing solutions (such as a semisolid grease in a solvent) that seem superior to ordinary oils. One such preparation has kept automobile bolts and nuts rustfree for the life of the car. Other rust-preventing preparations that have been suggested by various authorities for threaded and other joints include pipe-thread compound and lard-and-graphite mixtures. Use linseed oil on screw and bolt threads.

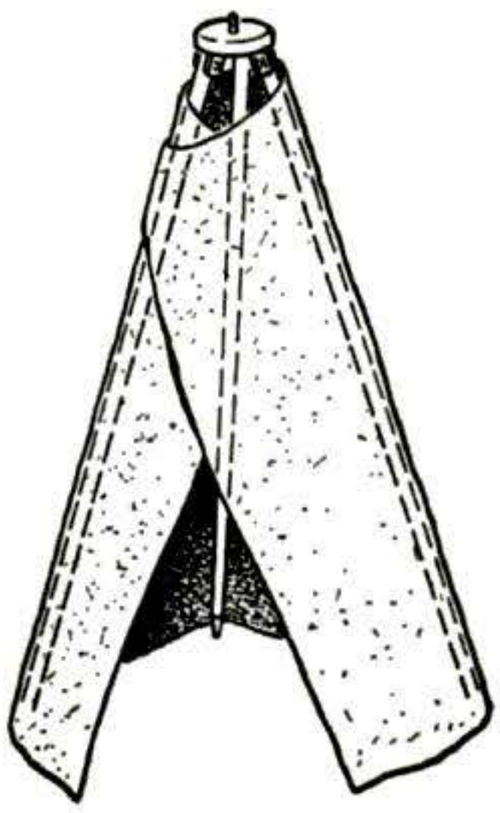
A Wiring



WITH this wiring system, you can turn off the garage light from the house—and not interfere with the garage's own electrical outlet. Yet the system takes only four wires instead of the five usually required for this convenience.

The saving comes from making the light and the outlet share a common

Tripod Tepee for a Youngster



ONE way to keep a small child contented when confined to the home is to provide him or her with a play tepee. One can be constructed in a few minutes by wrapping and pinning a blanket or sheet around the legs of an opened camera tripod.—*G. E. Hendrickson, Arygle, Wis.*

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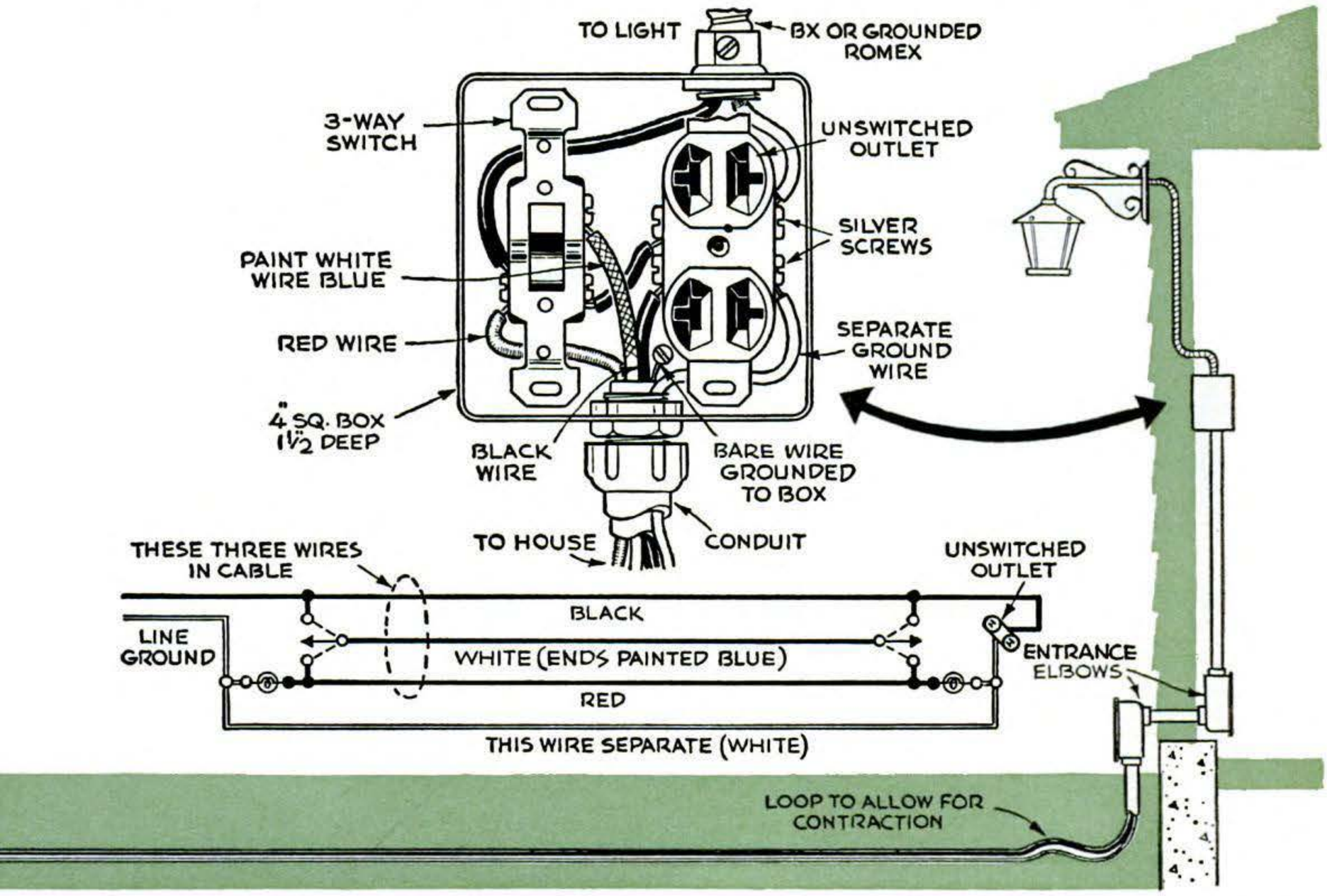
Trick That Saves Wire



ground wire. This single wire can be insulated with type TW plastic, rubber or neoprene, depending on what's locally acceptable for direct burial.

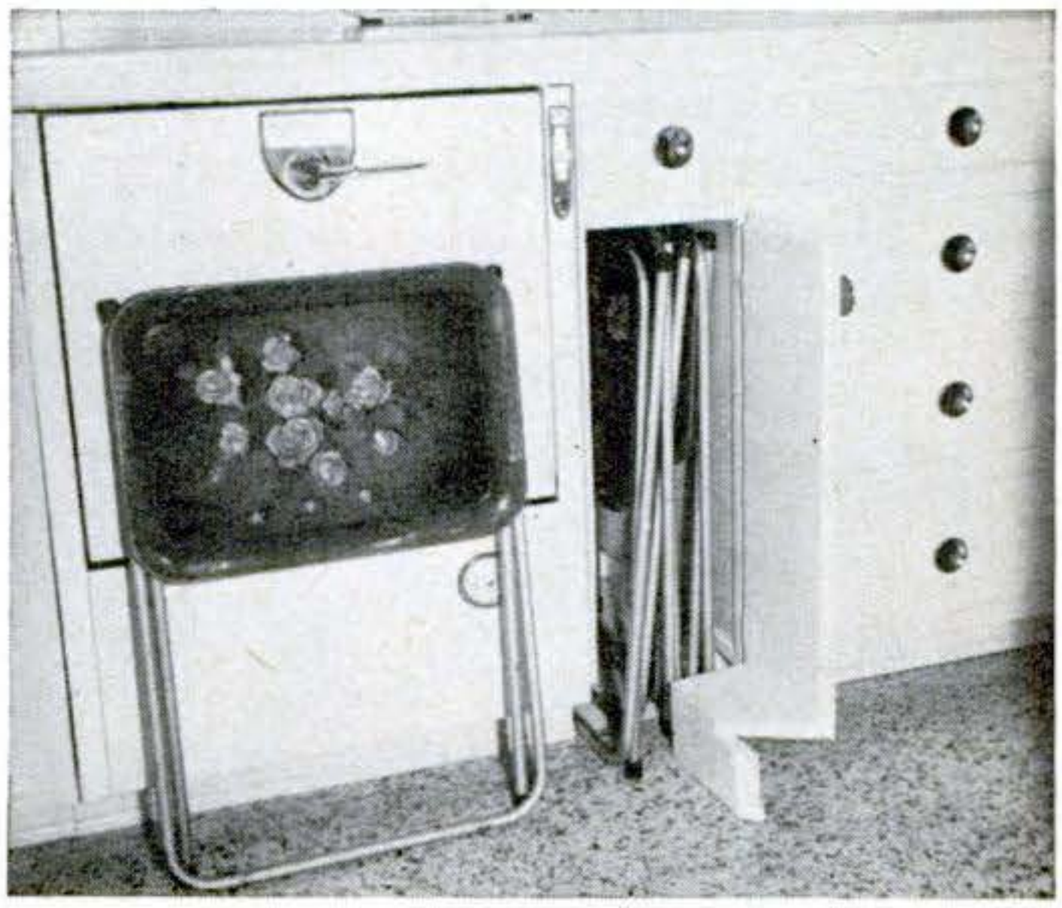
The cable is the plastic-covered UF type, containing a bare ground wire in addition to three insulated conductors. The bare wire is used only for grounding conduit and boxes to conform to code.

Both wire and cable must be buried in the same trench, and protected by a board if subject to injury. Where they're exposed between building and earth, they're protected by conduit.

The same wiring method can be adapted to serve an outlet on a post light.

Storing TV Tables in the Kitchen

STORING TV tables under the kitchen counter need not mean giving up drawer space. Albert Peterson of Venuta, Cal., solved the problem by cutting through the toe-strip and attaching it to the door. —*Earl Stowell, Gardena, Cal.*



▶▶▶OFTEN a socket-wrench universal joint is too supple to maneuver to the bolt or nut. Wrapping it with a layer or two of friction tape will stiffen it, yet provide the flexibility needed to turn the socket after the wrench is fitted and the nut started.—*Chester Johnson, San Francisco.*

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The sound improves and the set looks better if you build a

Speaker Base for a Table TV Set

THIS plywood base makes a table TV look and sound like an expensive console. How? Simple—the matching base is actually a tuned enclosure designed for a 12″ high-fidelity speaker.

Specific dimensions depend on both the TV set and your new speaker. Minor variations from the dimensions shown, however, won't spoil the cabinet's sound.

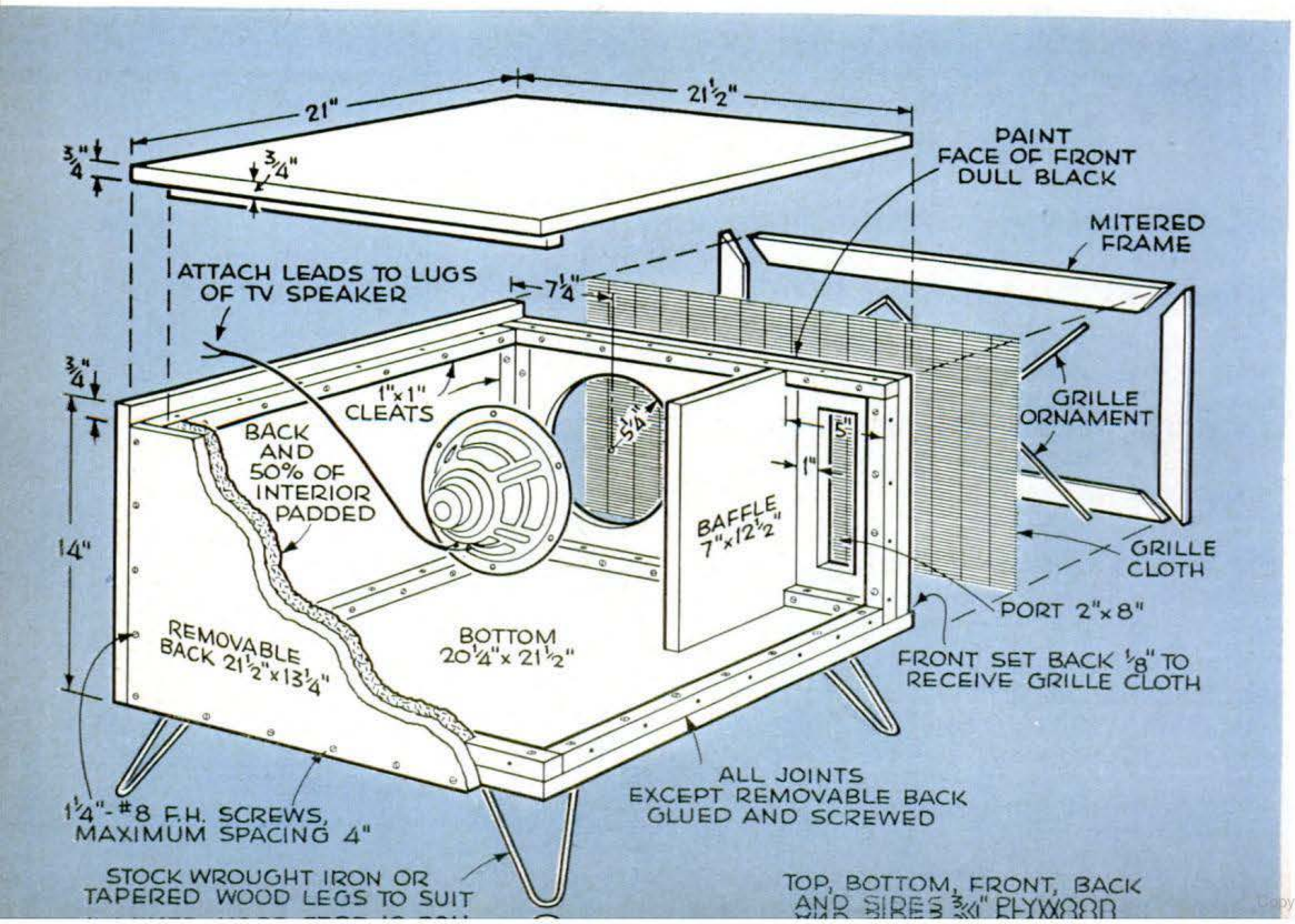
Keep in mind that most floor-model TVs stand about 40 inches high. And remember that the height of the new base must be at least two inches greater than the diameter of the speaker you use.

The instructions that come with the new speaker, plus some pencil-and-paper work, give specific dimensions for the port, speaker opening and bolt spacing.

Line the back and half of the interior of the enclosure with sound-deadening material—carpet padding, glass fiber, acoustic tile, or blanket insulation.

To connect the new speaker to the TV set, run insulated lamp cord or TV lead-in from the new speaker's binding posts to soldered connections at the old speaker's voice-coil lugs.

For best results, replace the TV output transformer to match the new speaker. If you prefer, this is a quick job for a TV serviceman. And for a final touch, you can tune the port with the Popular Science Hi-Fi Test Record by connecting the speaker to your phonograph system.



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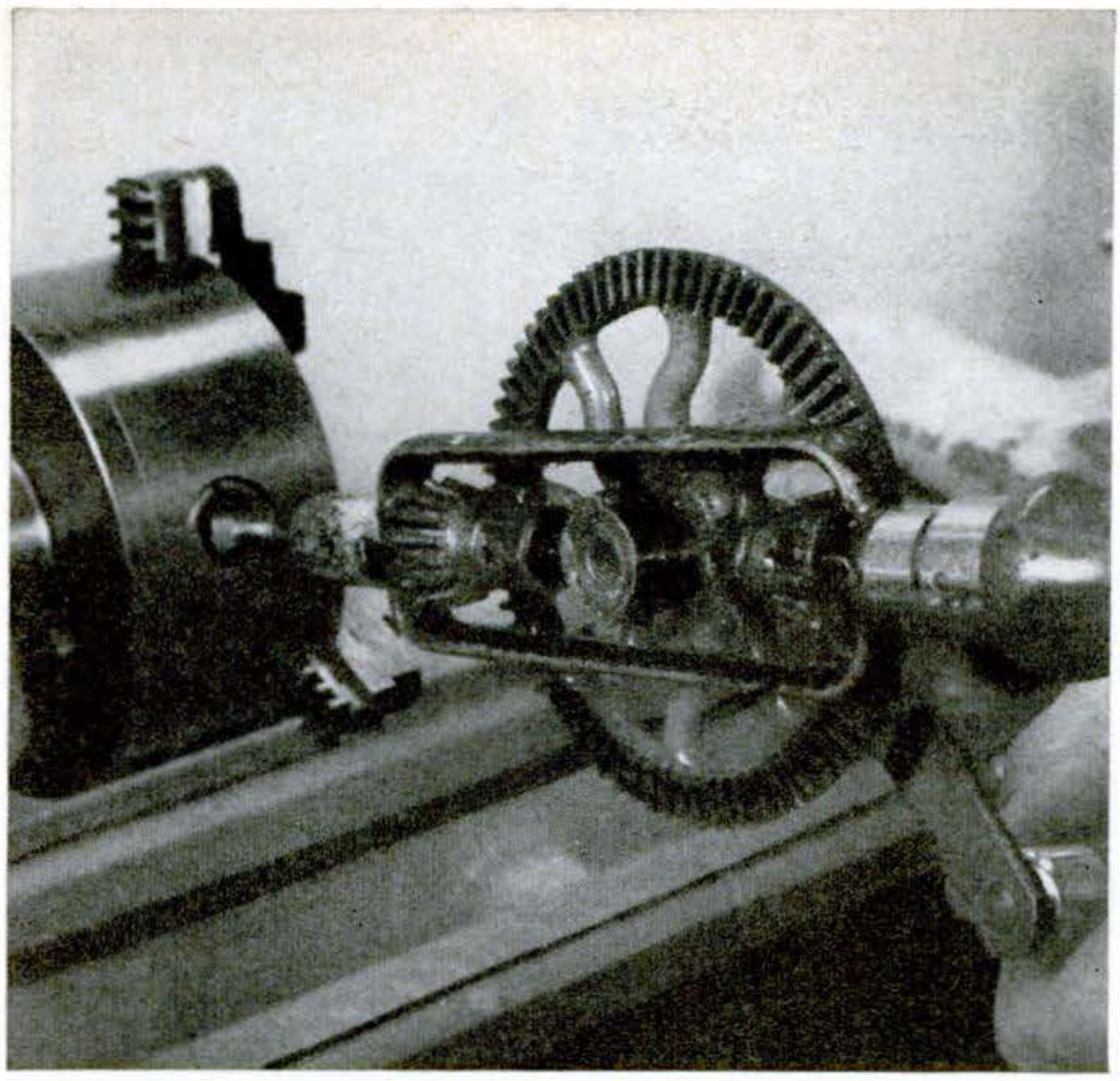


Short Cuts and Tips

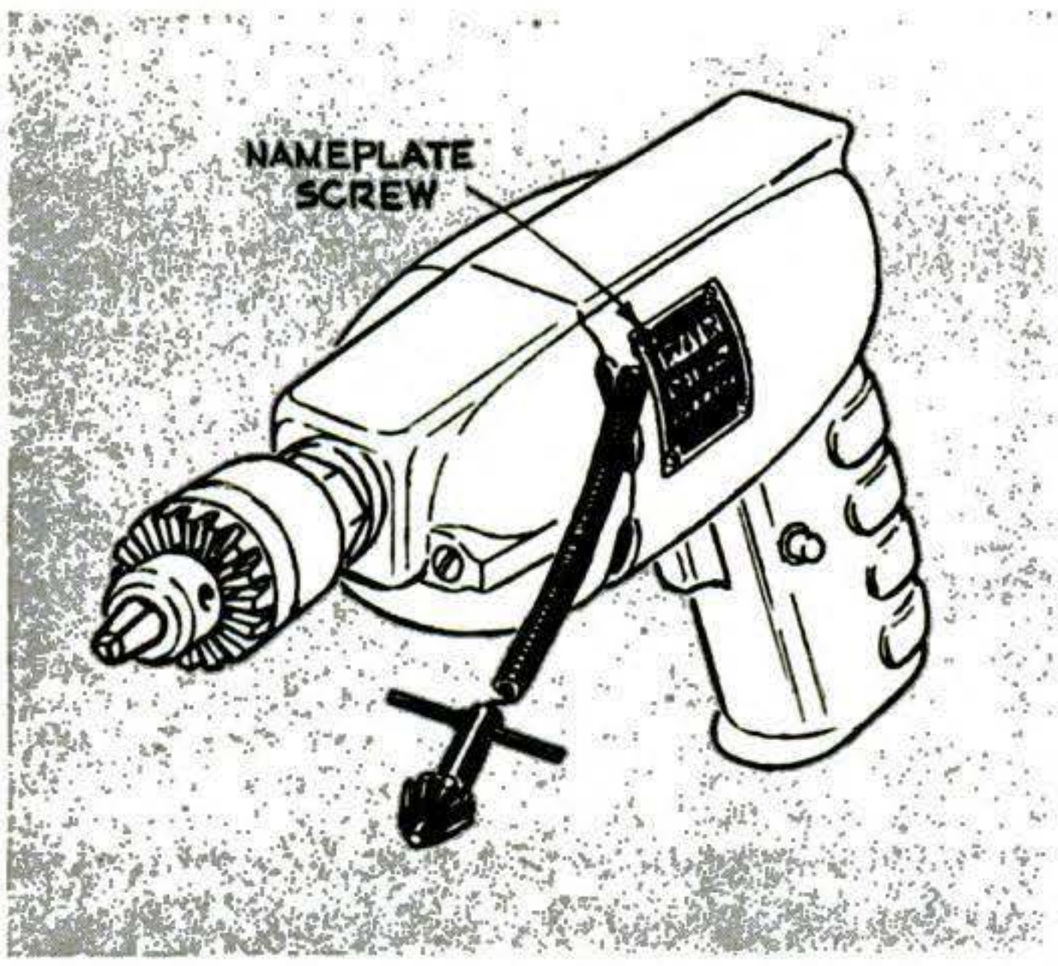
FROM PS READERS

Speed Key for Lathe Chuck

To ADJUST the jaws of a three- or four-jaw lathe chuck quickly, file a square end on the shank screw of a hand drill and use it in place of the regular key. You will still be able to screw the drill chuck back on for normal use, as plenty of threads will remain on the shank above the squared end.—*H. J. Gerber, Stillwater, Okla.*

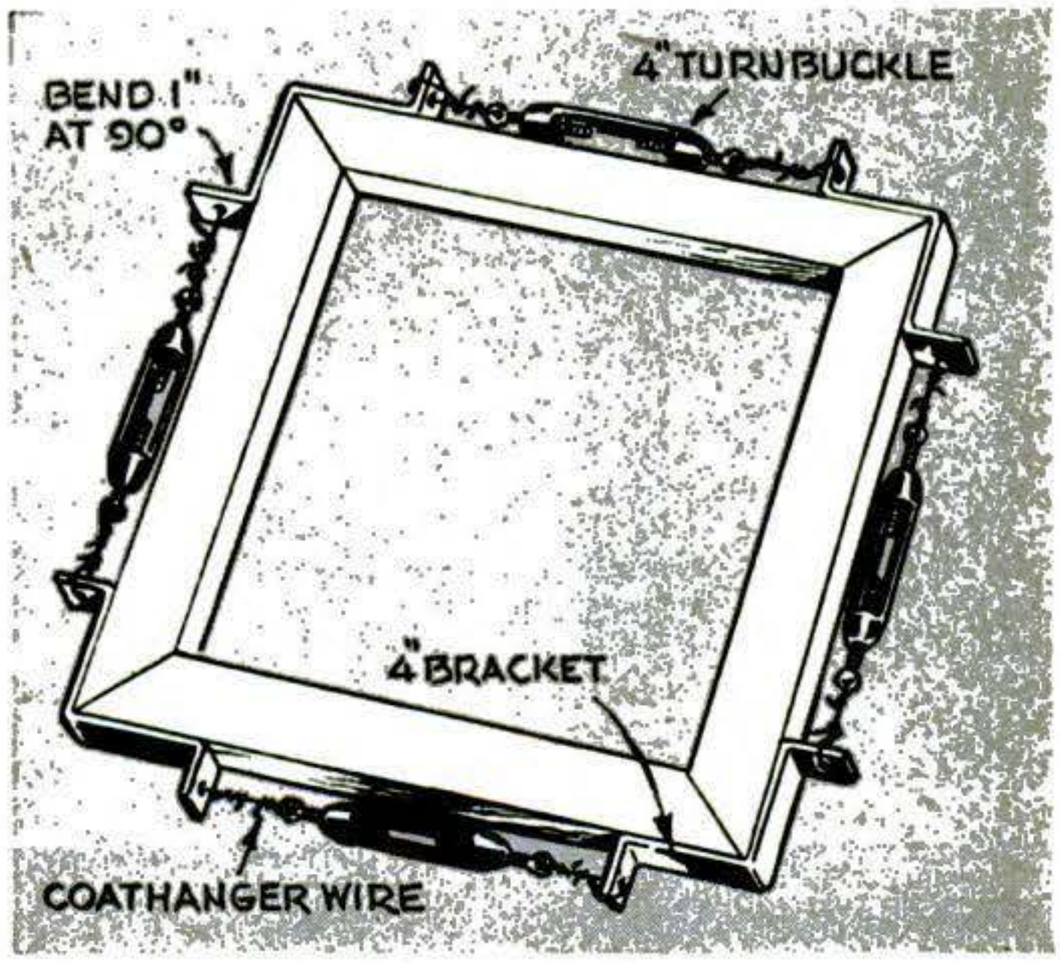
▶▶▶WHEN the time comes to remove your Christmas tree, use a pair of pruning shears to snip off its branches. If you cut them small enough, you can put them all in a container which can be carried outside without dirtying the house.—*Edward Bentley, Jackson, Mich.*

▶▶▶I HAD a number of lag screws to drive so I tried chucking the square heads of the screws in the jaws of a hand brace. The brace made short work of turning them home, and the firm grip gave me complete control over the angle of insertion.—*Gerard P. Lietz, Chicago.*



Spring Keeps Chuck Key Handy

I WAS always looking for the chuck key for my electric drill, until I tied it to the drill with a spring. I fastened one end of the spring under one of the nameplate screws, and bent a loop on the other end to fit the stem of the key. The spring stretches easily to reach the chuck.—*R. W. Pedersen, Boyd, Minn.*



Five-and-Dime Frame Clamp

A LITTLE hand work with pliers can transform four angle brackets, four turnbuckles and some coat-hanger wire into a handy picture-frame clamp. A surprising amount of pressure is exerted on the frame corners when the turnbuckles are tightened. But be sure you tighten them evenly.—*George A. Thompson, Dallas.*

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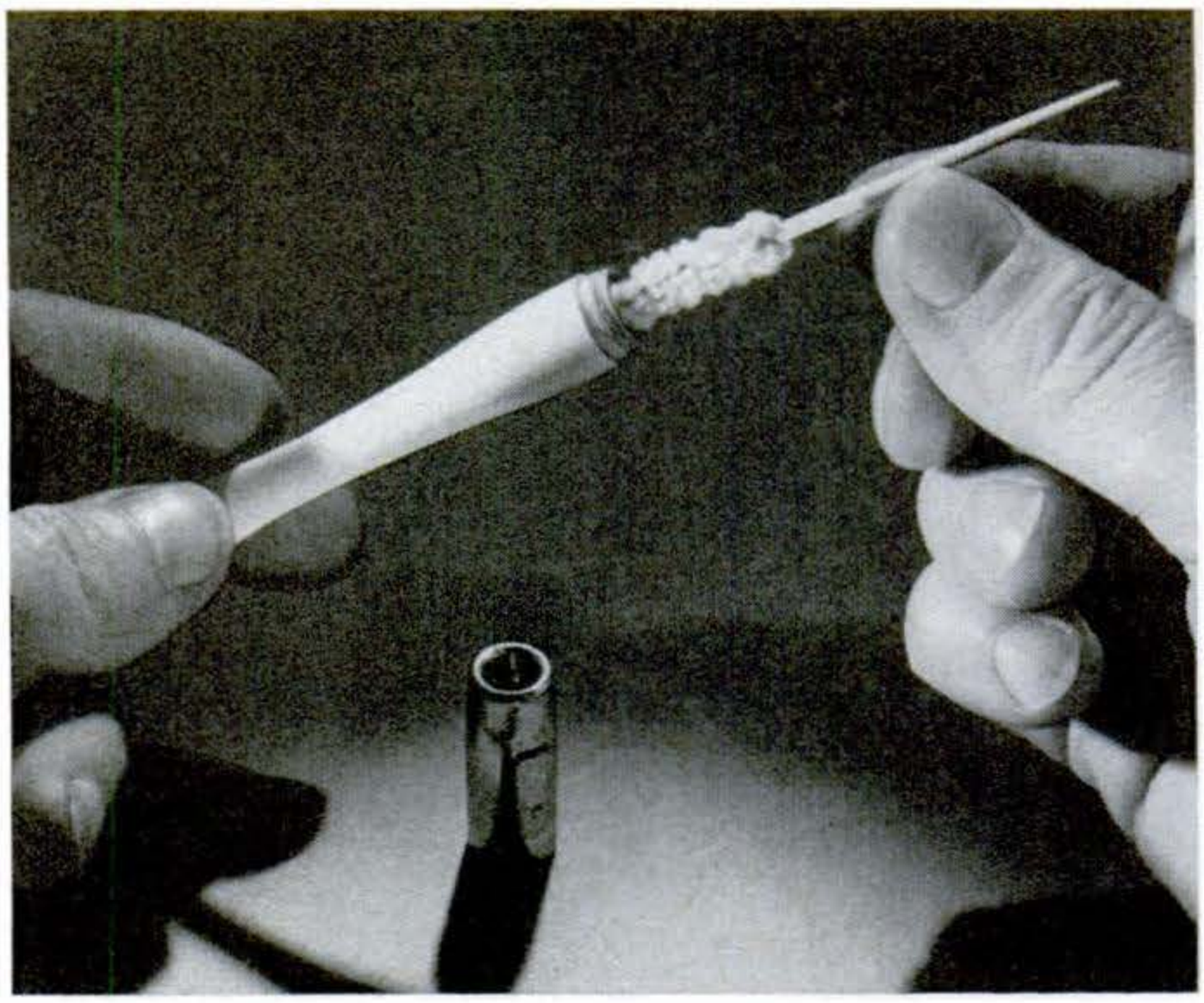
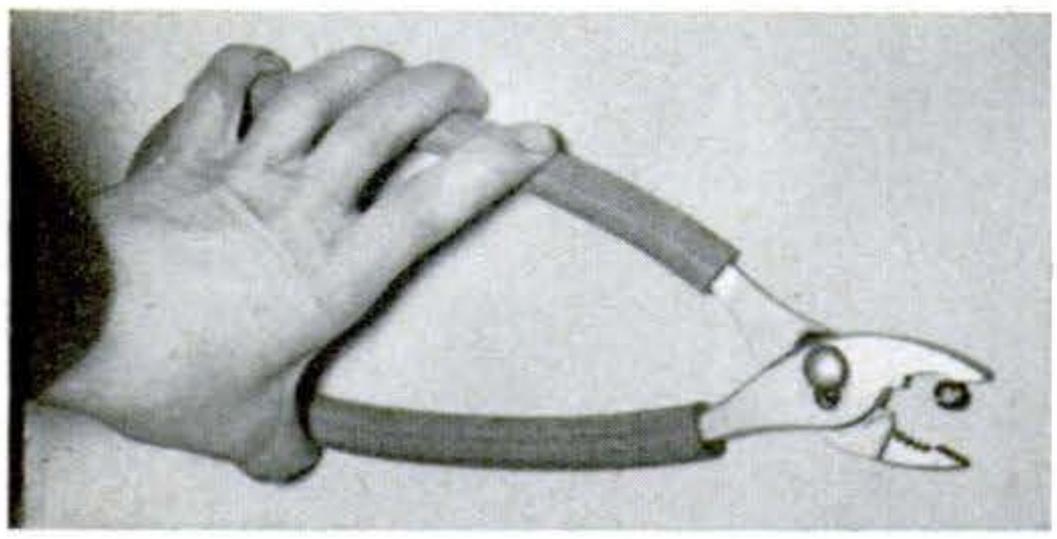
Short Cuts and Tips

FROM PS READERS



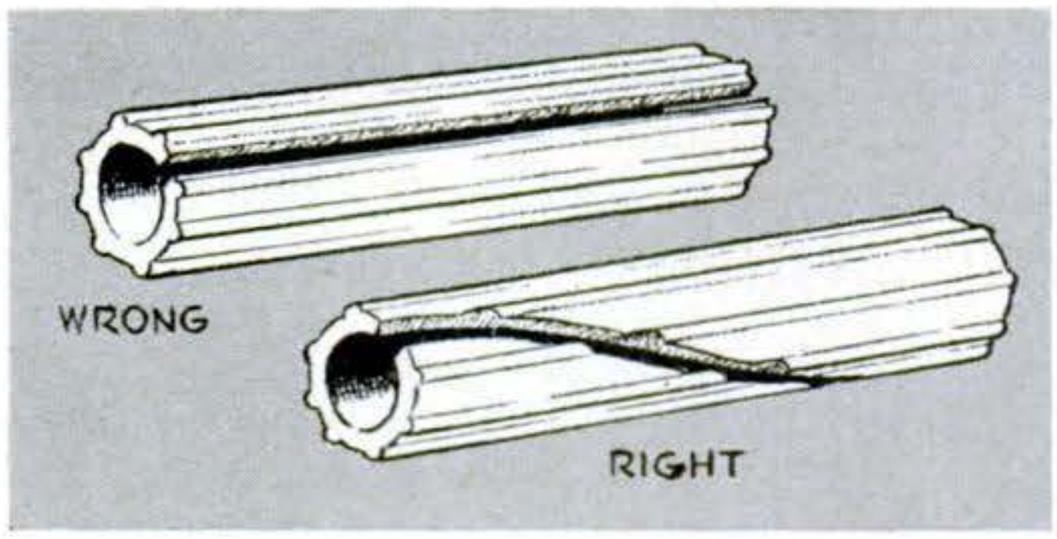
Make-Your-Own Cigarette Filter

CIGARETTES without filter tips can be filtered by stuffing a pipe cleaner in an ordinary cigarette holder. Wind the cleaner tightly around a toothpick, slip it in, then remove the toothpick. Discard the cleaner when it becomes discolored. —*Ken Kramer, NYC.*



Hose Springs Plier Jaws Open

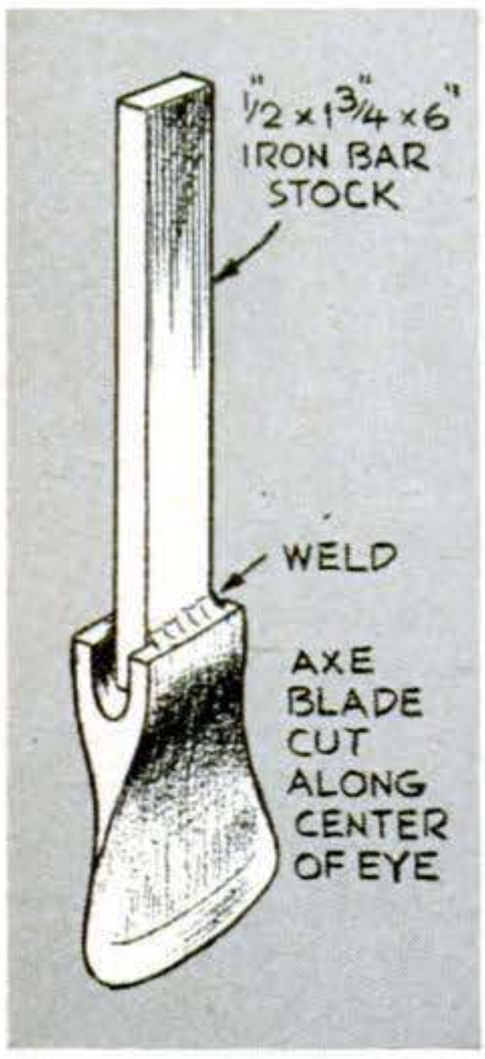
A SHORT length of hose will make pliers open their jaws automatically when you release your grip. Slip one end of the hose over each of the handles to form a loop that acts just like a spring.—*Ann Zawistowski, Coon Rapids, Minn.*



Bucket Grip Can't Slip Off

A PIECE of hose makes a good grip for carrying heavy loads in a pail, but it often keeps slipping off the handle. If you cut a spiral slit down the side, instead of a straight one, the grip won't come off.—*Daniel Bousha, Jackson, Mich.*

Up-and-Down Chopping Tool



WHEN an old axe head developed a crack beside the eye, I cut through it below this point and welded one end of a heavy bar of flat iron in the slot.

The result is a hefty, weight-loaded blade that makes fast work of loosening hard earth, cutting roots in postholes, chopping holes in pond ice, and cutting low brush.—*D. E. Henry, Oquawka, Ill.*

Easy Way to Ground an Outlet

THE three-hole adapter plugs that come with power tools and appliances are a nuisance to use and their protection is usually lost because most people never bother to attach the ground wire. I save the bother by permanently wiring several adapters to the cover-plate screws of outlets around my home, shop and garage. They're always handy and can't get lost.—*Al Melling, Brooklyn, N. Y.*

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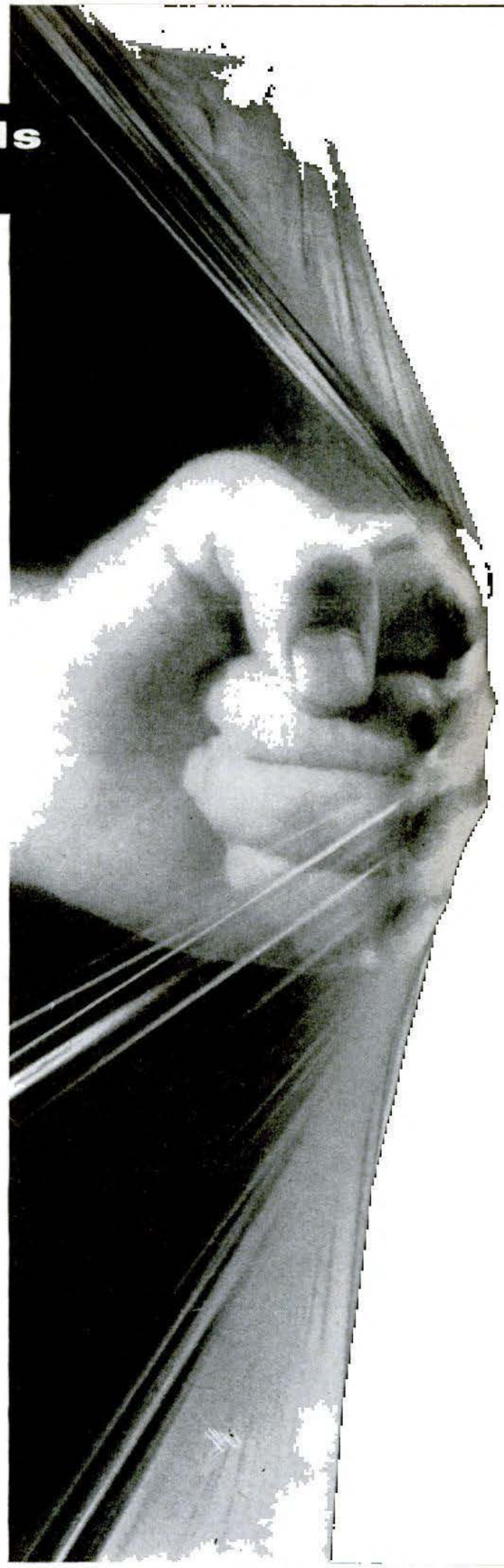
materials file

What you should know about sheet polyethylene—

The Plastic Film of Countless Uses



HOME owners who dismiss polyethylene as just another plastic film have some surprises coming. Polyethylene film isn't like the older, more familiar acetate or vinyl films. Here's why:

- It's tough. A sheet of polyethylene only .006″ thick will hold more than 20 pounds' pressure per square inch—a tensile strength better than that of steel in the same thickness.
- It's waterproof. Moisture doesn't get through it, even in vapor form.
- It's chemically inert. There are a few solvents that will weaken it somewhat, but

FILM IS TOUGHER than most plastics, resists punctures and tearing. It stretches under strain, returns slowly. Strain must be evenly distributed along edges by wrapping around support or clamping under battens.

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Poly Bag Suffocations:

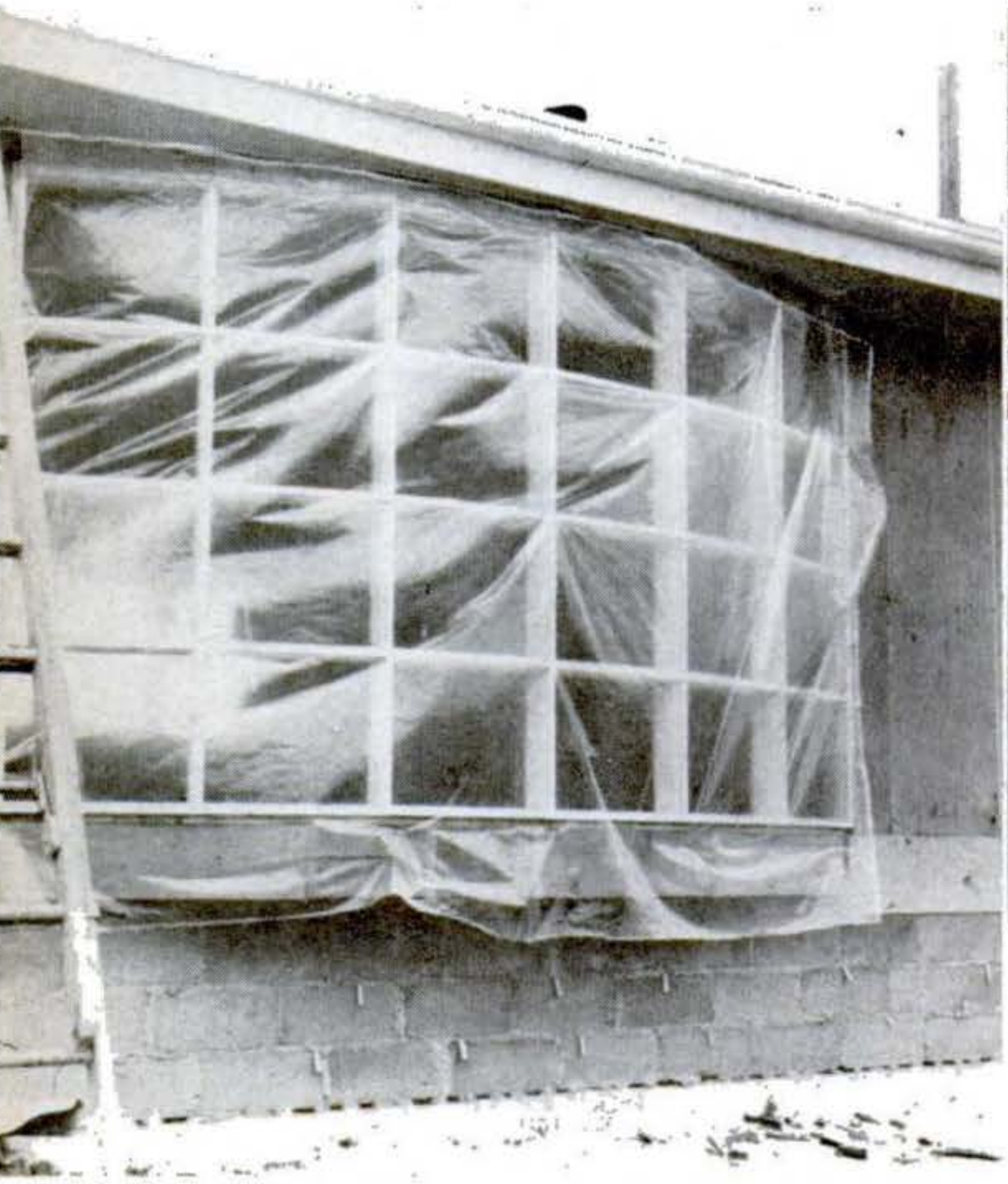
RECENT suffocations caused by polyethylene dry cleaners' bags shouldn't make you shy away from all polyethylene. Some dry cleaners have used bags only .0006″ thick. It's this extreme thinness that makes the bags susceptible to static electricity, and makes them cling. The film you buy by the foot at your hardware store probably will not be less than .002″ thick.

even these evaporate and leave the film untouched. Such chemicals aren't found in household use.

- It's big. You can buy single seamless sheets big enough to cover a city lot, without resorting to special orders.
- It's cheap. A sheet big enough to roof a one-car garage costs less than $10.
- It's light. The weight of 1,000 square feet of the heaviest film is less than 30 pounds.
- It's flexible. Even in cold weather, you can fold a 9′-by-12′ poly drop cloth into a pocket-size package.
- It won't rot. The only natural enemy of polyethylene is ultraviolet. And this is whipped by dying the stuff black to make it reject ultraviolet rays.
- It's readily available. Major manufacturers' by-the-yard films are commonly sold by lumber yards, hardware stores, farm-implement and mail-order houses.

All these wonderful attributes don't mean a thing, however, if polyethylene film isn't selected and used properly.

Where to use it



FAST TEMPORARY CLOSURE for hole in wall or roof during remodeling project is easy with large sheets. One piece can cover a roof.

STORE LAWN FURNITURE ON THE SPOT under cocoon of plastic. Weight of furniture will anchor film. Black film lasts longer outdoors.

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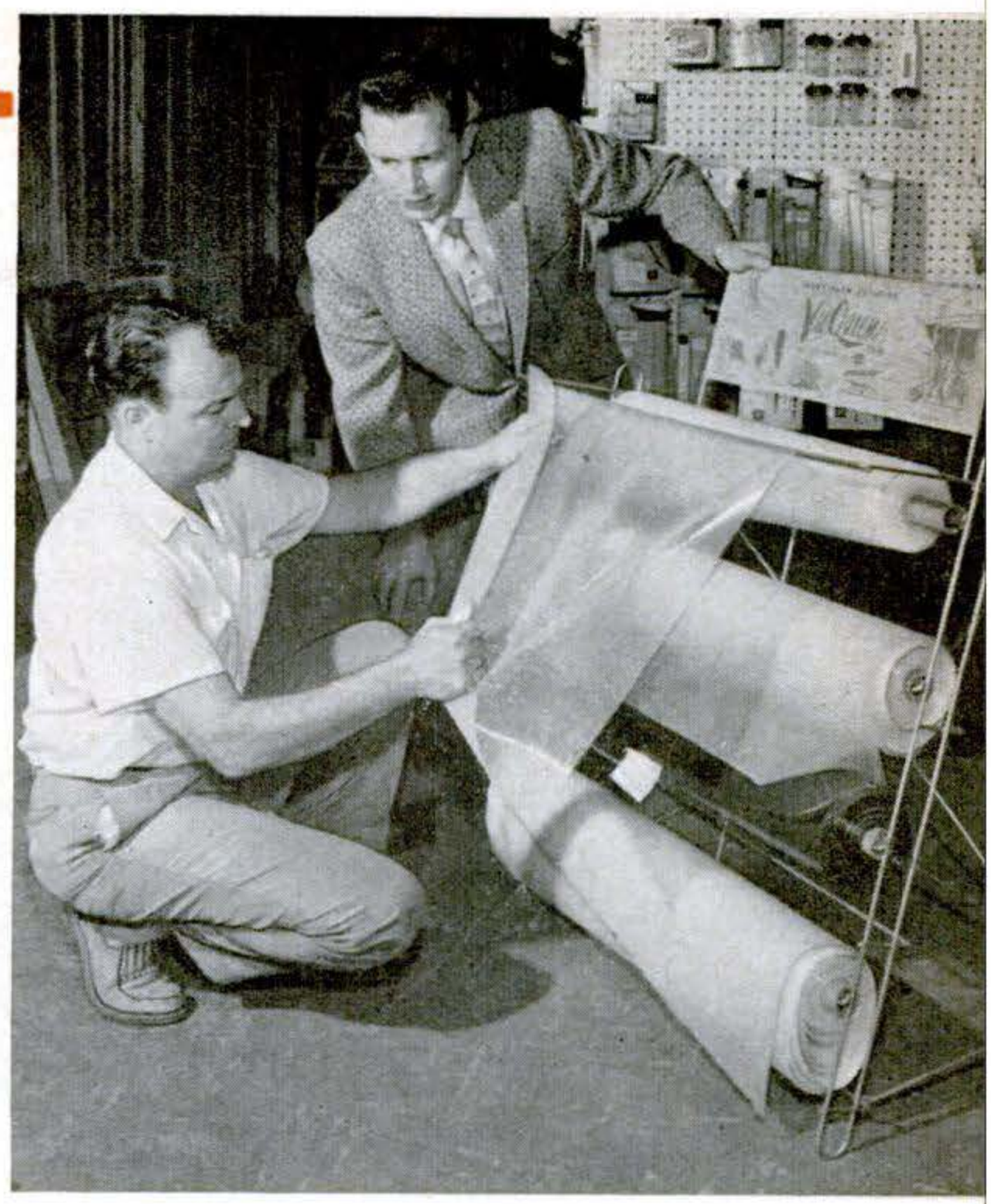
Where to buy it

YOU CAN BUY FILM BY THE RUNNING FOOT; some is edge-marked for easy measuring. Rolls also come in dispenser boxes.

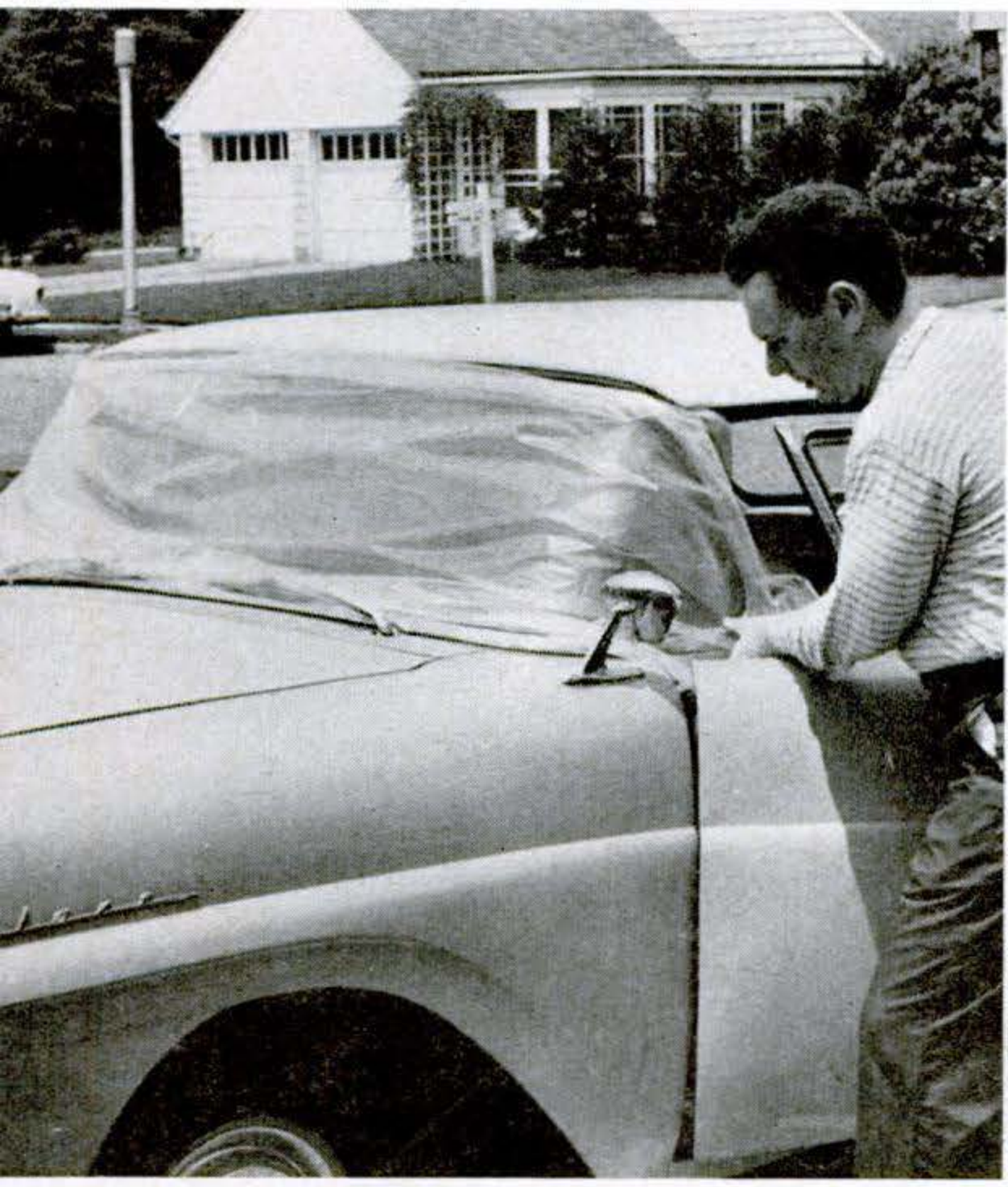


Its qualities must be respected to be rewarding.

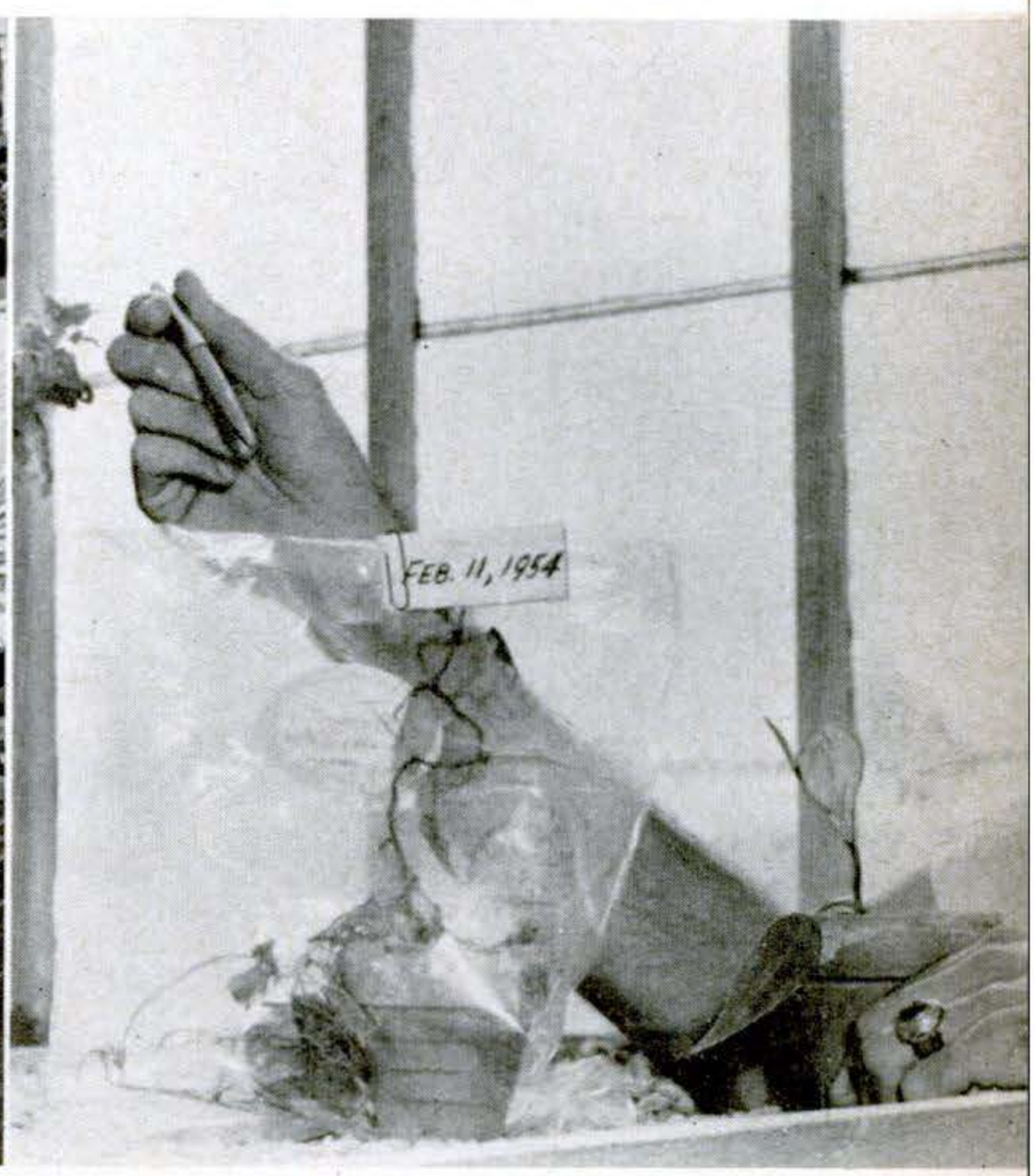
Thickness is important. You'll find polyethylene films most generally available in two-, four-, and six-mil (.006″) thicknesses. Most readily available widths are three, six, and 10 feet, although it can be had in two-foot multiples up to 40 feet.

Common roll lengths are 50 and 100 feet, but most stores sell film by the running foot. And don't let the narrow rolls on the store's racks fool you—handling and shipping demands that larger widths be folded before rolling.

In addition to varying in width and thickness, poly film varies in color. Some



WINDSHIELD STAYS FROSTFREE if protected by a piece of film held by doors. Lighter-weight films can be used for this purpose; ice shakes off.



HOUSE PLANT IN PRIVATE GREENHOUSE of vaporproof film will live indefinitely without additional watering. Bag is folded over, then stapled.

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—the super-thin packaging material—is almost crystal clear. Thicker sheets run to milky transparency.

The film is made in white expressly for concrete curing. It reflects sunlight to slow evaporation. It's made in black, too. The darker color helps thwart the ultraviolet rays that deteriorate polyethylene.

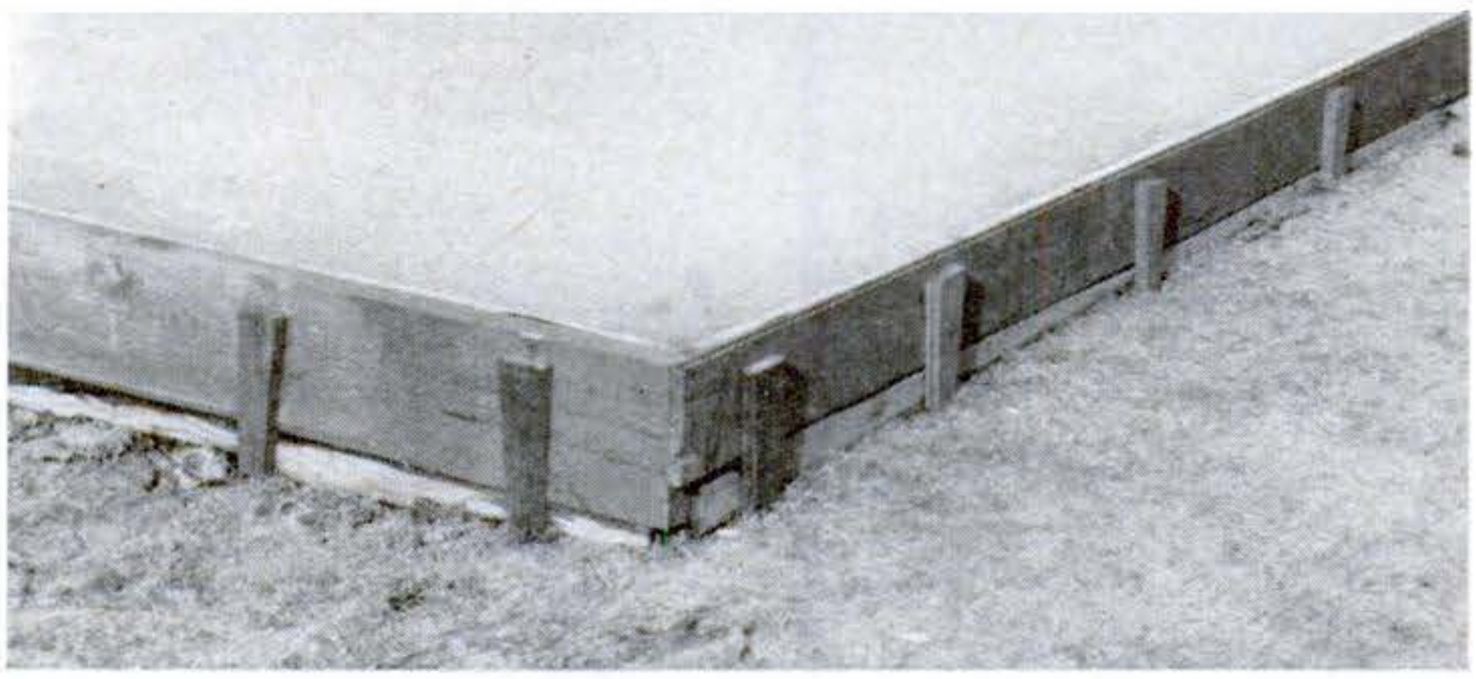
The film can be—and is—made in almost any color. Only the natural and black are available at retail stores. The opaque white is offered commercially only to industrial suppliers.

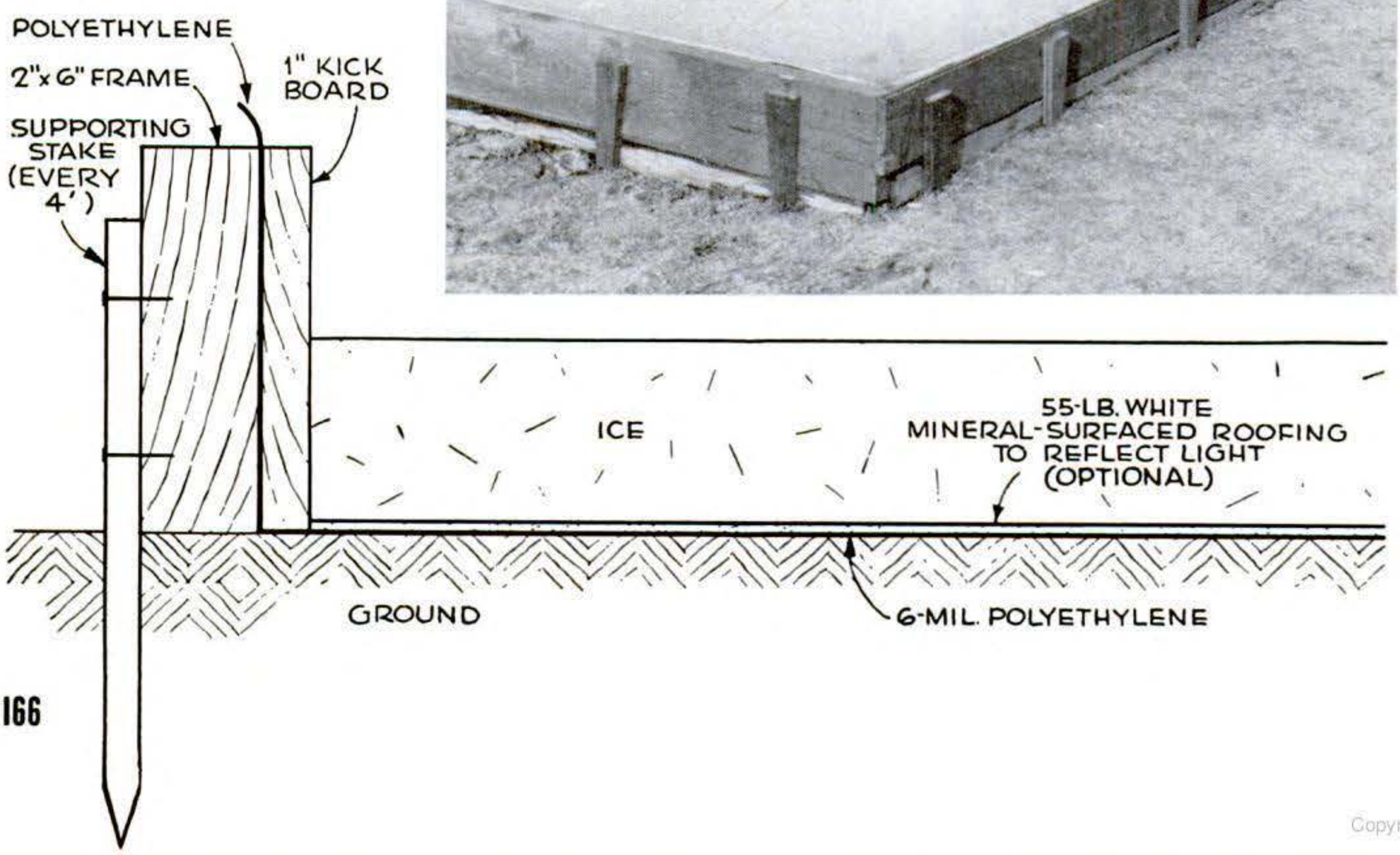
Price depends not on color or width but on thickness. The 2-mil sheet goes for about a cent a square foot, four mils for twice that, and a square foot of the heavy six-mil stuff sells for about three cents.

These prices are one reason for the film's popularity. Generally, they're lower than those of the building felt or canvas that poly replaces. Low cost, plus the unique properties of the film, make it an ideal material to keep handy in the home shop or garage. You'll find that even small scraps never go to waste.

Polyethylene film comes in large sheets

SINGLE SHEET OF FILM waterproofs wooden box to make a skating rink that won't leak during a thaw. Polyethylene sheet is protected from skate blades by 1"-by-6" wood bumper. Same technique can be used to make oversize photo trays or tanks. A sheet of film lining a wood or cardboard box waterproofs it.





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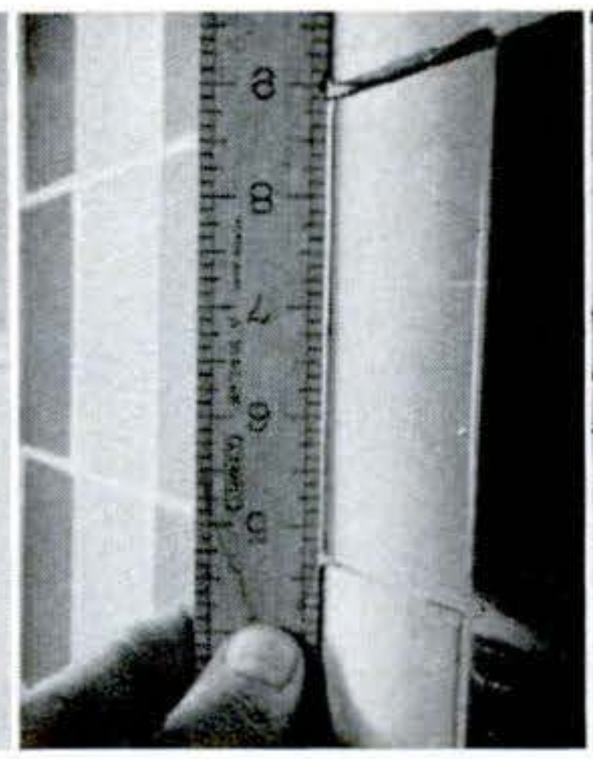
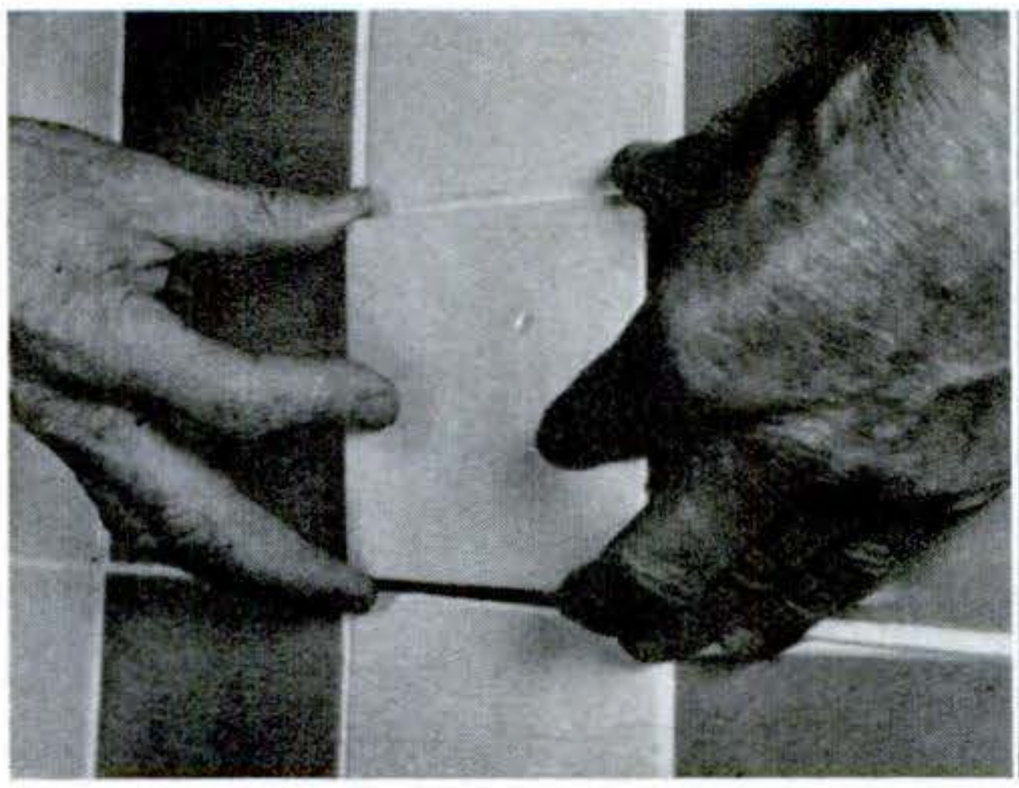
Ceramic Tile

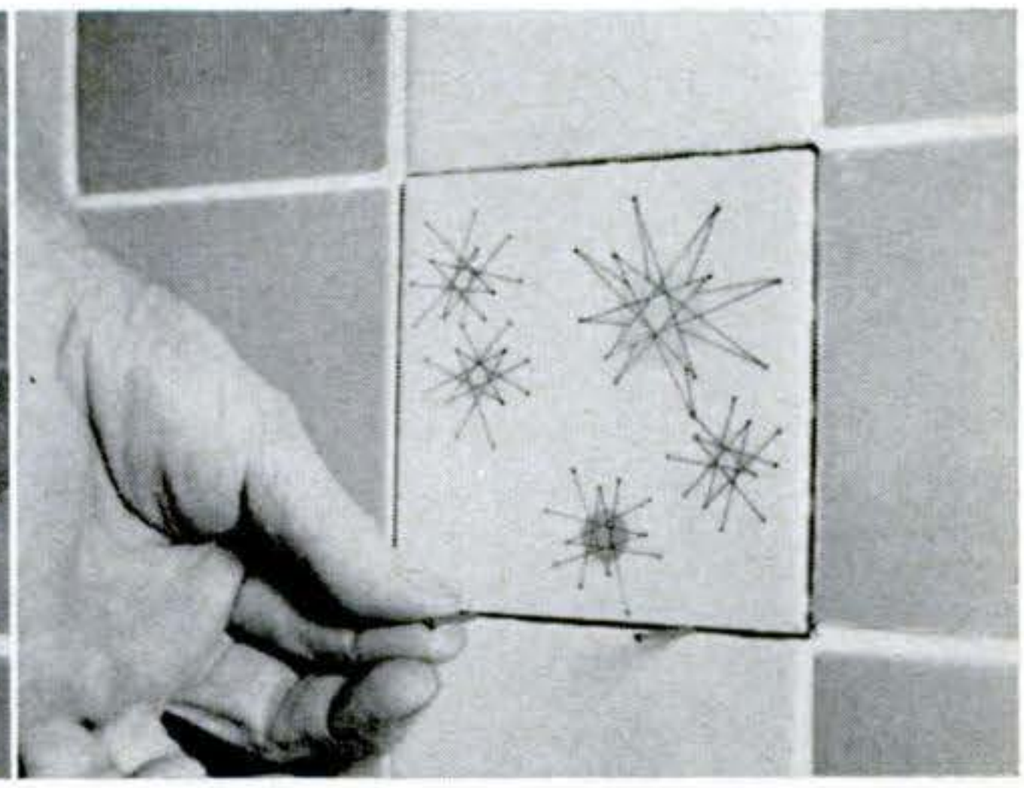
BEST REPAIR for a cracked or chipped tile is to break it out and replace it. Use a nail set and a hammer, and start in the center of the cracked tile so surrounding tiles are not injured. Chip away little fragments until you can pry the remaining pieces loose.

How to replace a broken tile



CLEAN OUT OLD ADHESIVE or mortar with a putty knife or an old chisel, taking care not to gouge the plaster wall. Try the new tile (center) to be sure you have about ⅛″ for the fresh adhesive. One convenient waterproof adhesive comes in a tube. Squeeze an ample amount on the wall and be sure to spread it evenly over the space.





PRESS THE NEW TILE IN PLACE after squeezing several gobs of adhesive on its back. Place a straightedge over it to be sure it is flat, and flush with the surrounding tiles.

IF YOU CAN'T OBTAIN MATCHING TILE, select a contrasting color or decorative design. Maintain grout space by inserting two nails beneath the tile until the adhesive sets.

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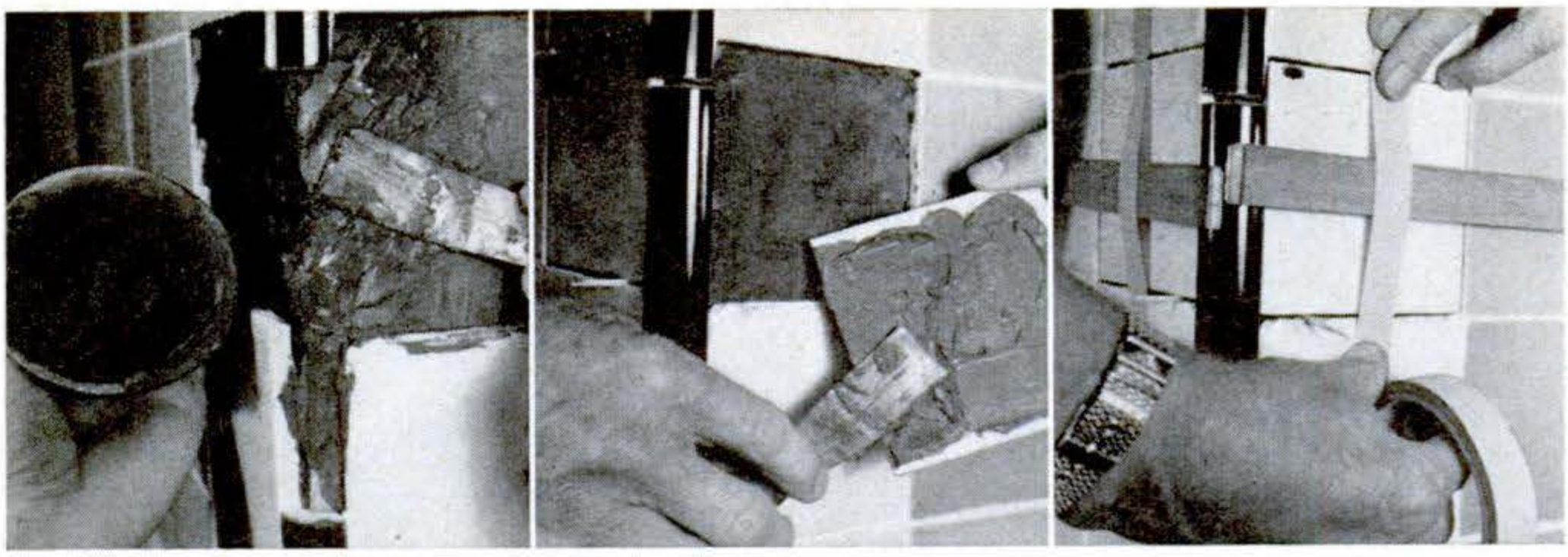
How to repair a smashed corner



REMOVE DAMAGED TILE and quarter-round corner strip. If plaster wall has been broken, repair it (left) with a mortar mix of one part portland cement to one or two parts plaster sand. Soak the replacement tile in water, butter it with the same mortar (center) and press it in position. Slip spacers beneath bottom edge of tile and hold it in place with wood strips and masking tape (right) until mortar sets. Remove tape gently.

Renewing the grout between tiles

DIG OUT OLD GROUT with a screwdriver. Mix dry grout with water until it's like whipped cream. Dampen the cracks and brush the grout into them (left). Work the grout into the spaces with a damp cloth (center), then run the tip of your finger or the eraser end of a pencil along the grout lines (right) to make them slightly concave. Wipe the surface of the tiles clean with a soft, dry cloth before the excess grout hardens.

General upkeep and stain removal

A CRACK BETWEEN A TILED WALL AND TUB often occurs when the tub settles. If possible, beef up the supports to make the tub firm. Otherwise, clean the crack and fill it with a flexible crack sealer that will move with the shifting of the tub (left). Most stains on tile can be removed with household cleaners. For rust stains use a thin paste of oxalic acid and let it stand for 10 to 20 minutes (center). If grout tends to stain, scrape it out and renew it with grout mixed with mineral pigment to color it (right).

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New Covers for Tubular Dinette Chairs

MORE than 35 million plastic-covered, tubular-frame chairs were made in the last 15 years. With so many of these popular little chairs around, it's well to know that a sudden rip in the vinyl, or a cigarette burn, needn't put a dinette set out of business.

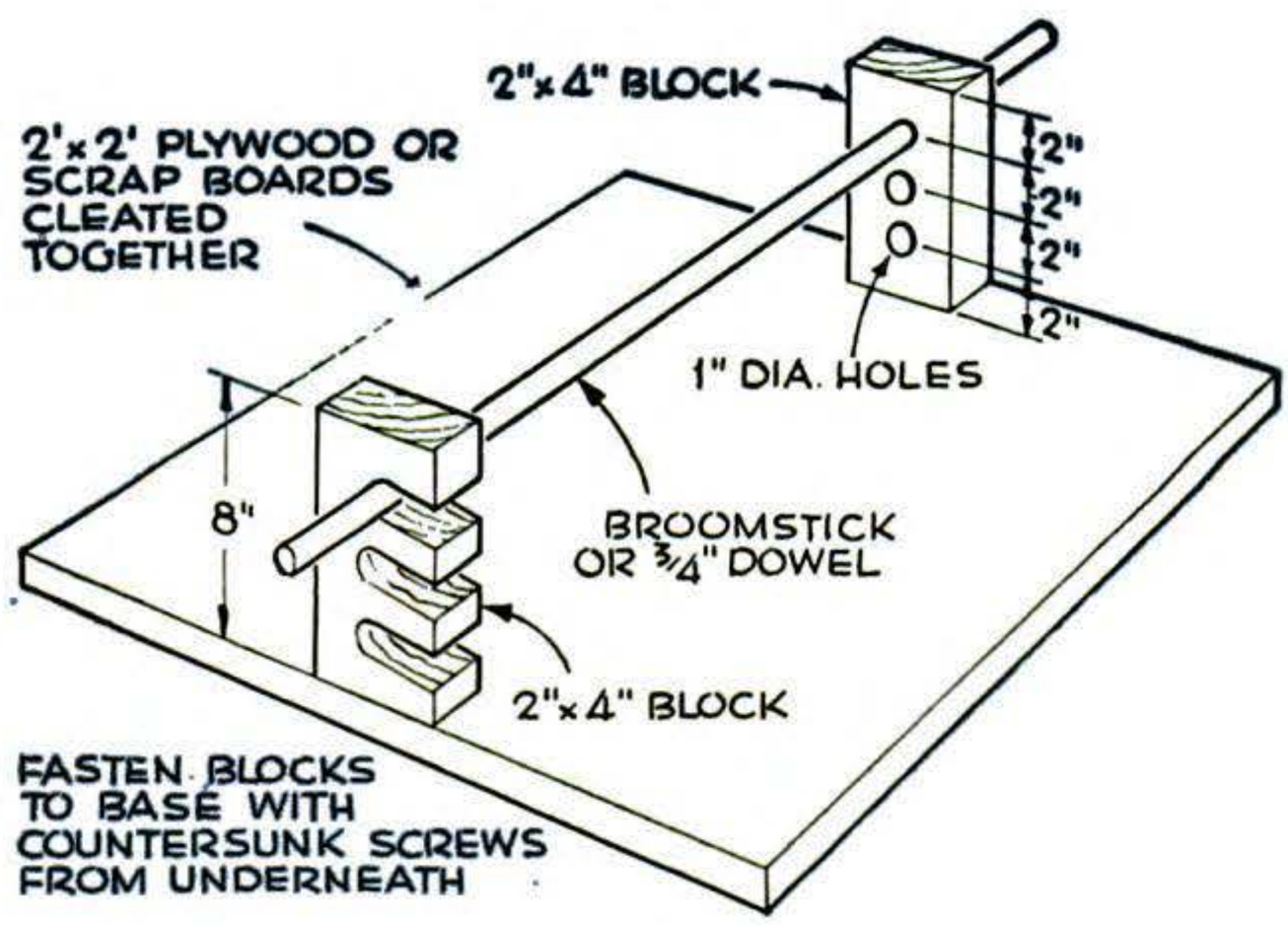
Putting on a new plastic cover is actually easier than conventional furniture upholstery, although many people don't realize it. And it can be done for as little as $5 for a complete set of six chairs.

Two secrets make the job a snap: 1) You heat the vinyl first so that it conforms neatly to curves and

AS GOOD AS NEW: Small plastic-upholstered chairs like this can be completed in as little as half an hour—without a wrinkle. Materials cost less than $1 a chair.

This press is the secret to a smooth, tight job

SIMILAR to presses actually used by furniture makers, this one can be made in a few minutes. By hooking the cross dowel into the holes on one side and the slots on the other, you can adjust pressure on any size of chair seat or back. This squeezes the padding while you staple the plastic in place. When the pressure is released, the padding springs back, stretching the plastic taut for a smooth job.



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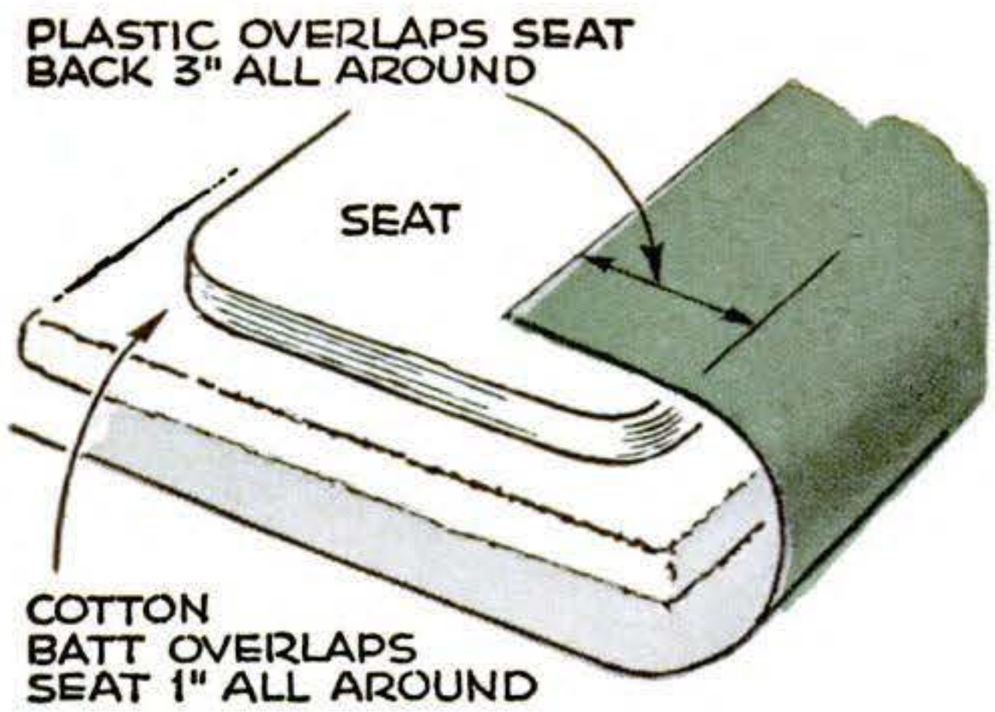

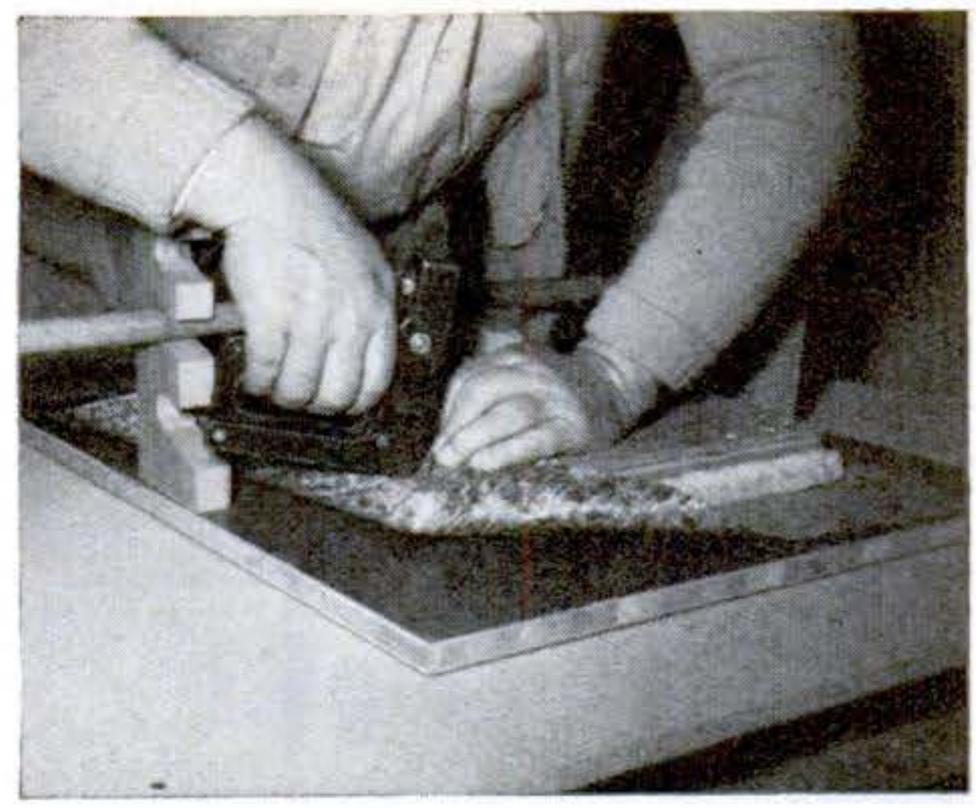

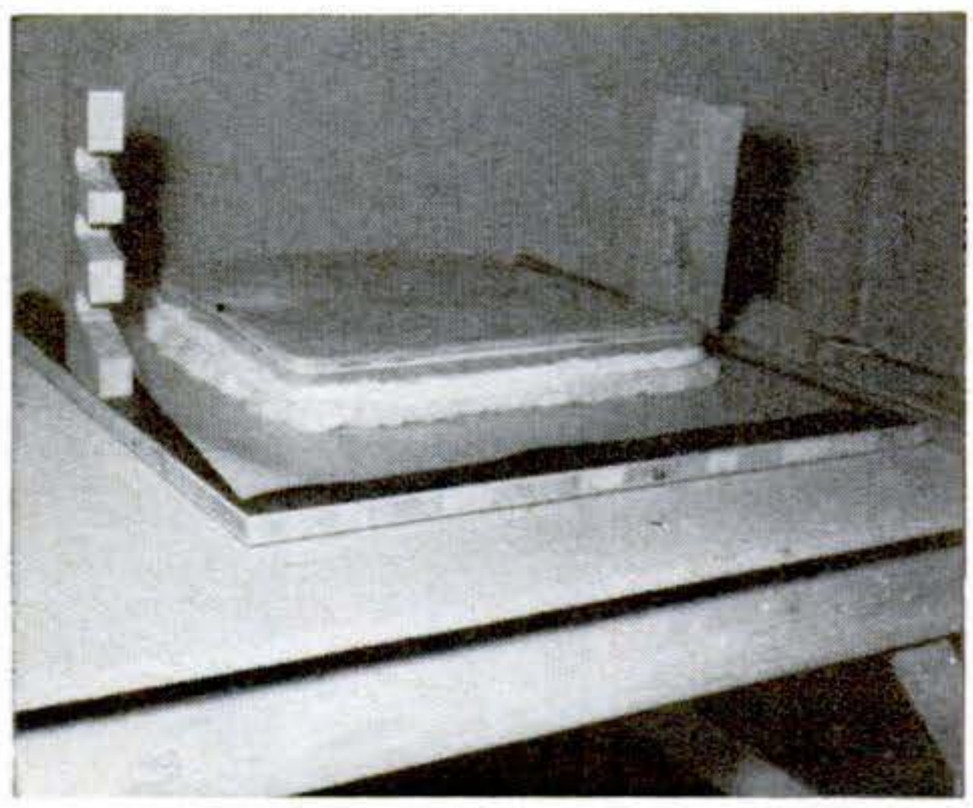

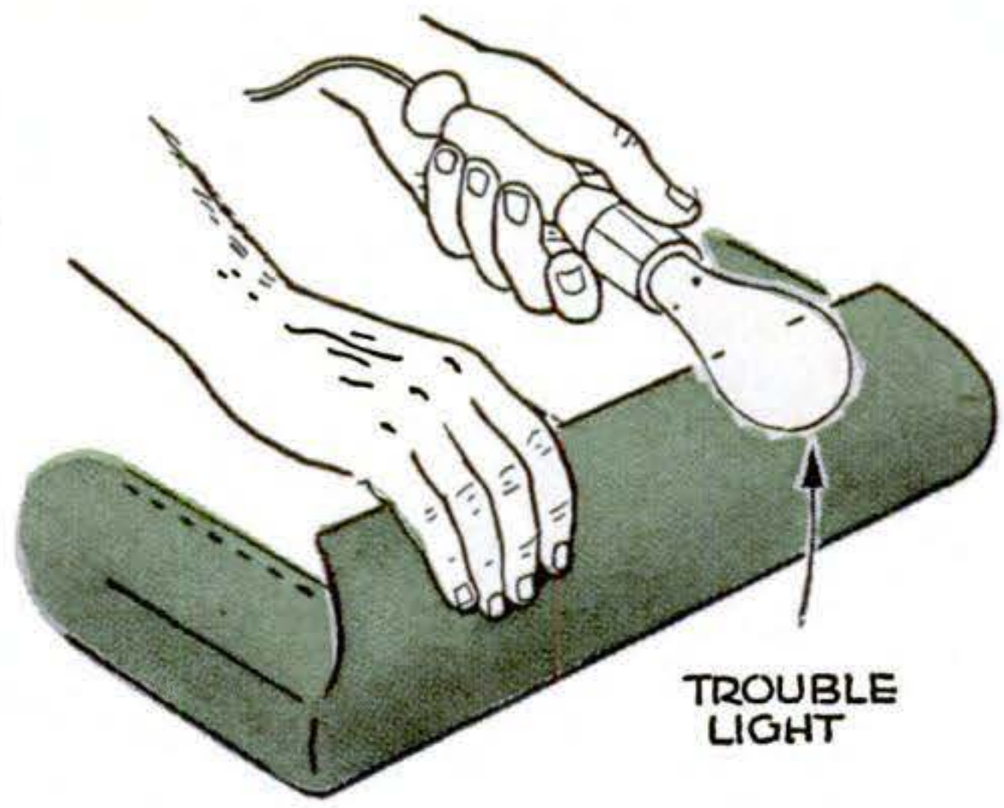

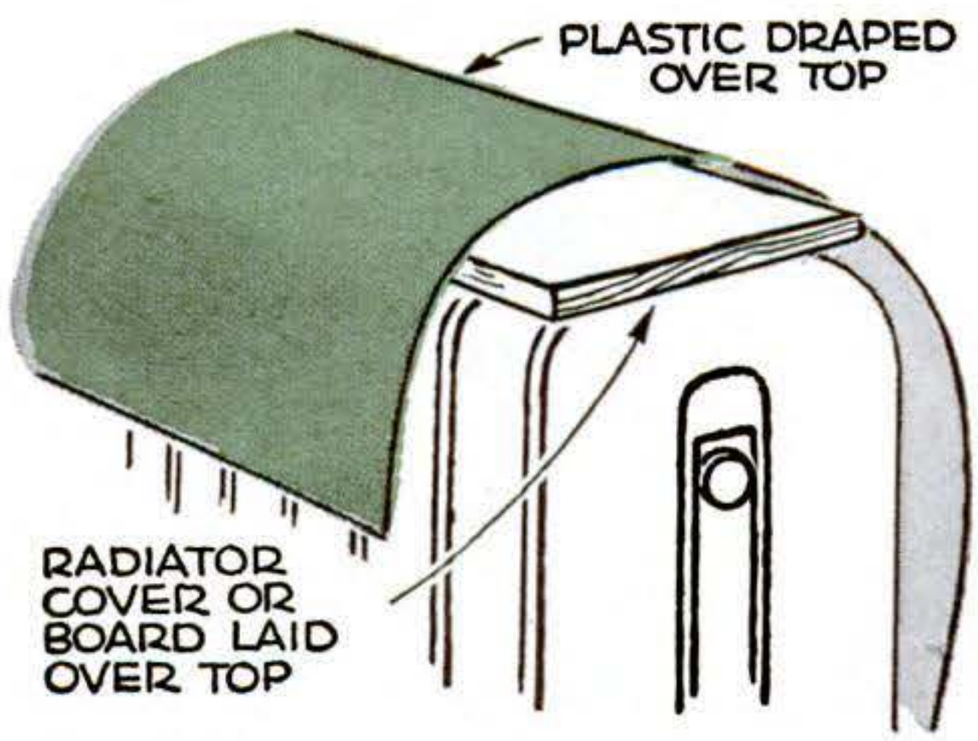

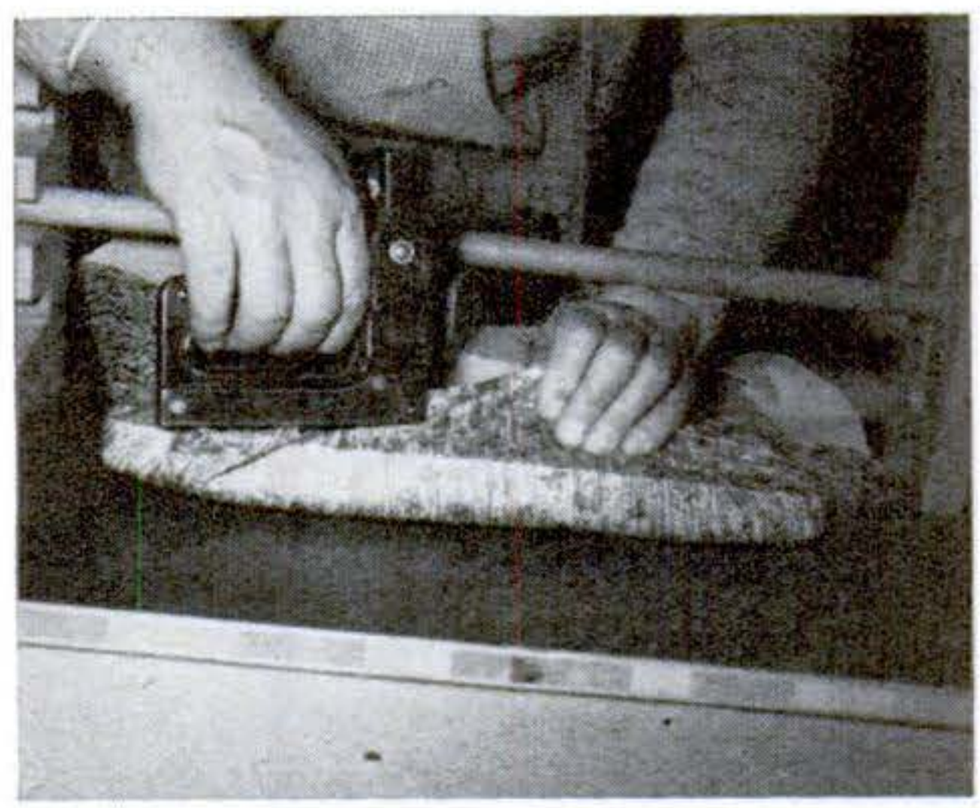

1 CUT PLASTIC TO SHAPE FIRST so that you can use it immediately after it's heated. Lay out the seat, with padding and the vinyl sheet underneath (photo and sketch at top), and trim the plastic 3" oversize all around. Then warm plastic over a radiator or heat duct for several minutes to soften it (do not use oven or range, as intense heat will melt it).

2 CLAMP SEAT IN PRESS, then start at a corner and pull heated plastic up over it (top). Stapling gun is quick, but tacks can also be used. Keep pulling material taut as you work along sides to remove all wrinkles. If plastic cools and won't smooth out, warm it with a light bulb. Note that bar in press rests on a block, not seat itself, to leave working room.

rounded corners without wrinkling. 2) You build the simple press as shown from scrap wood and a broom stick to hold the work firmly in place while you pull the plastic taut around the edges. The rest is a stapling job.

Buy a good grade of 12- or 14-gauge vinyl. You'll need about ¾ of a yard of 54"-wide material for each chair—three yards for a set of four chairs, 4½ yards for six. At the same time buy 2"-thick cotton batts for new padding—enough to cover each seat and back with 1" to spare around all edges.

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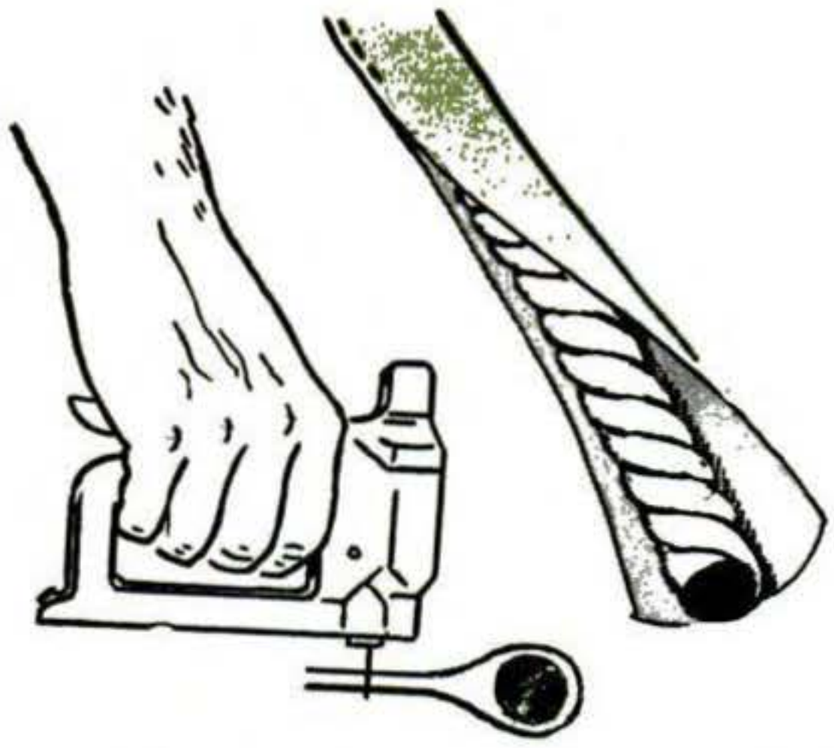
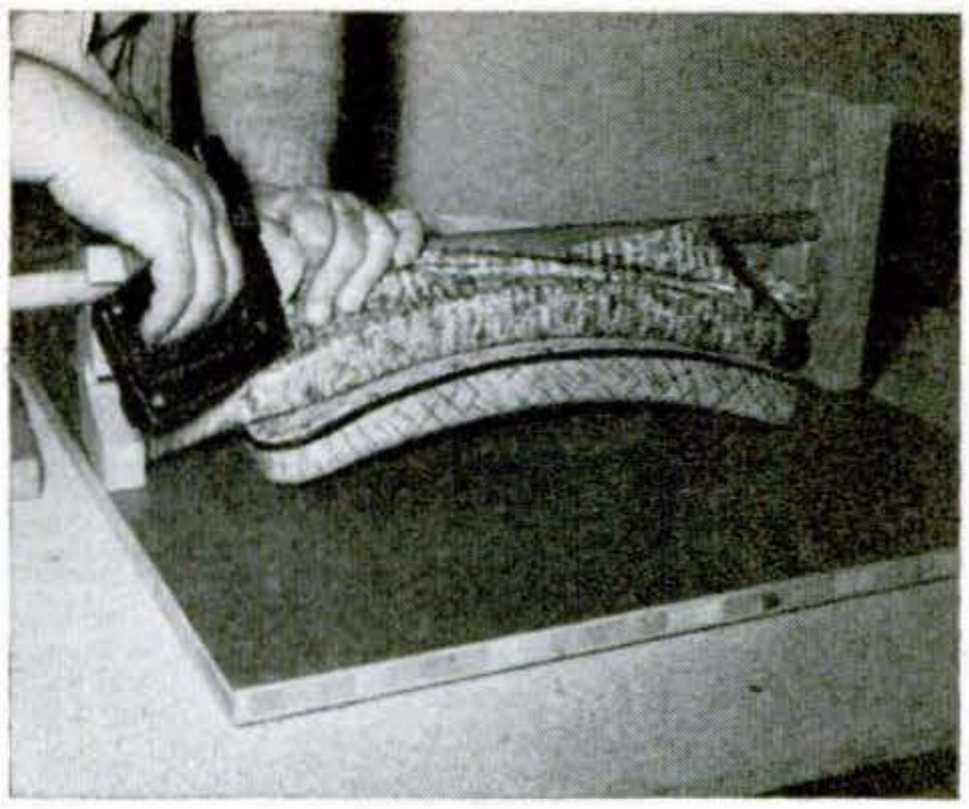
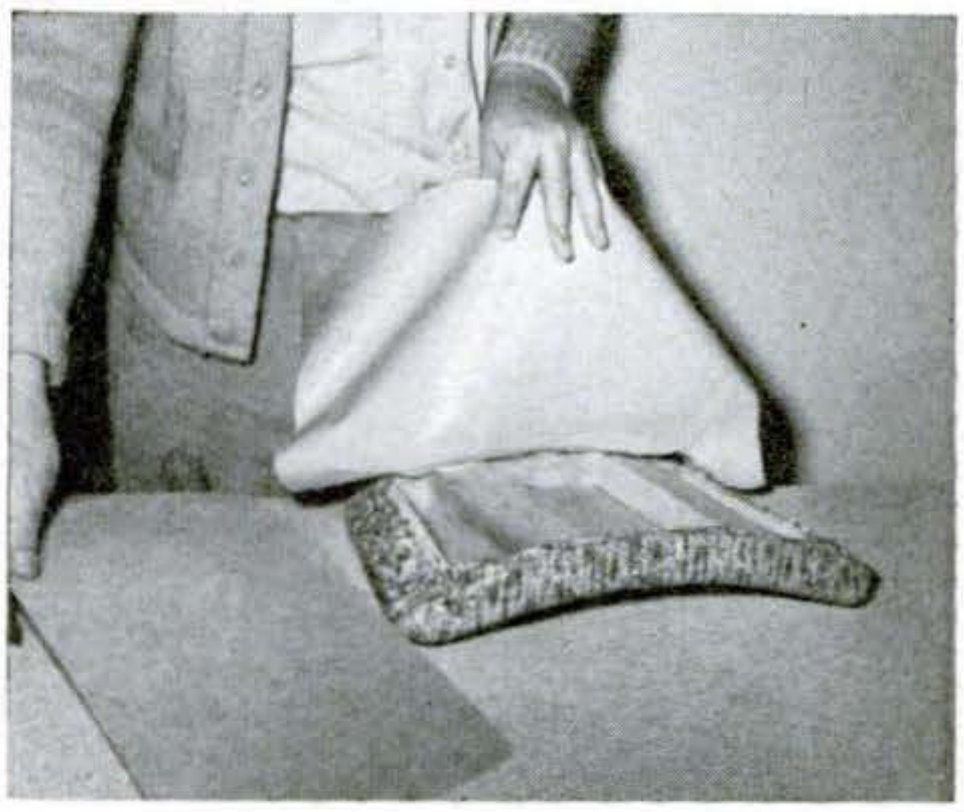
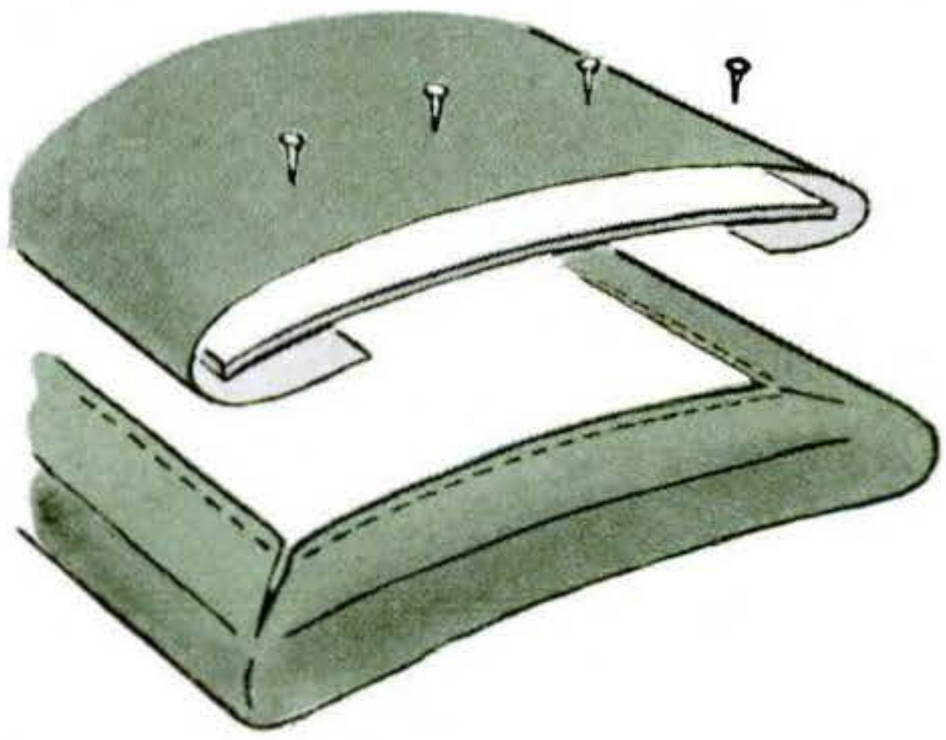


3 MAKE A NEW WELT by stripping old plastic off original welt, leaving the cord. Cut new strips of plastic 1″ wide and as long as cord. Fold the plastic around the cord (top) and staple it to lower edge of seat, starting at middle of back. Bottom of seat can be covered with black cloth if desired. Proof of wrinkleless job is seen in lower photo above.

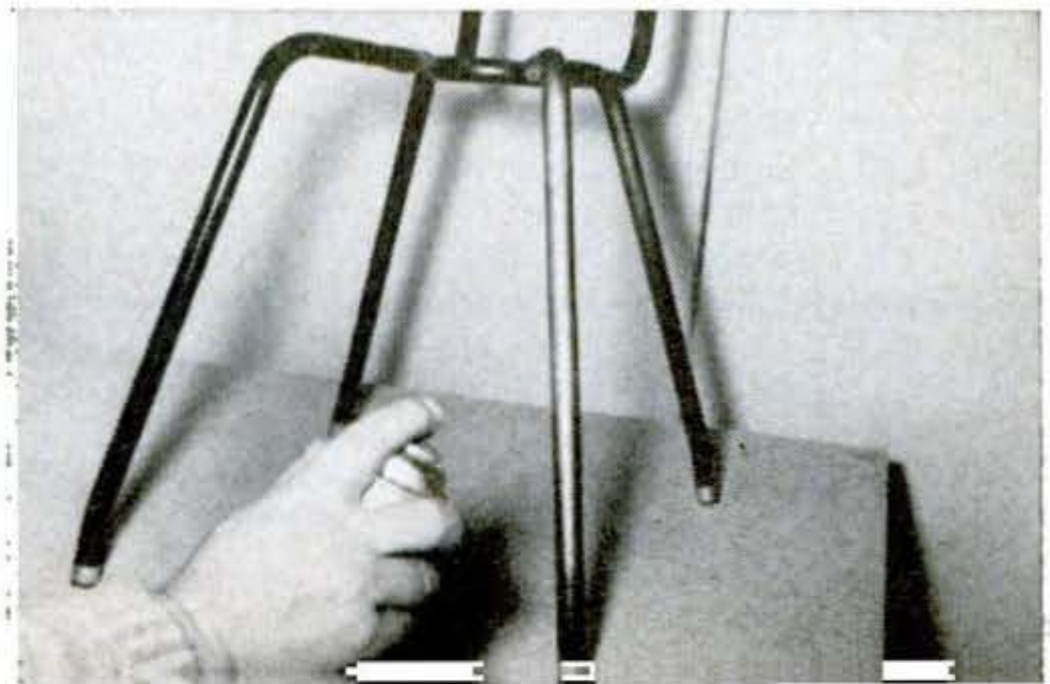






4 COVER SEAT BACK in the same way as the seat, but because it is curved, lay it over another back or block it up for support, then tighten the press against it (top). For the rear of the chair back, cut a sheet of heavy cardboard or fiberboard slightly undersize. Wrap the sheet with plastic (sketch above) and fasten with decorative upholstery tacks.

A QUICK PAINT TOUCH-UP can be given chairs' tubular frames while the seats and backs are removed. Black or metallic lacquer in a spray can goes on easily and smoothly, dries fast.



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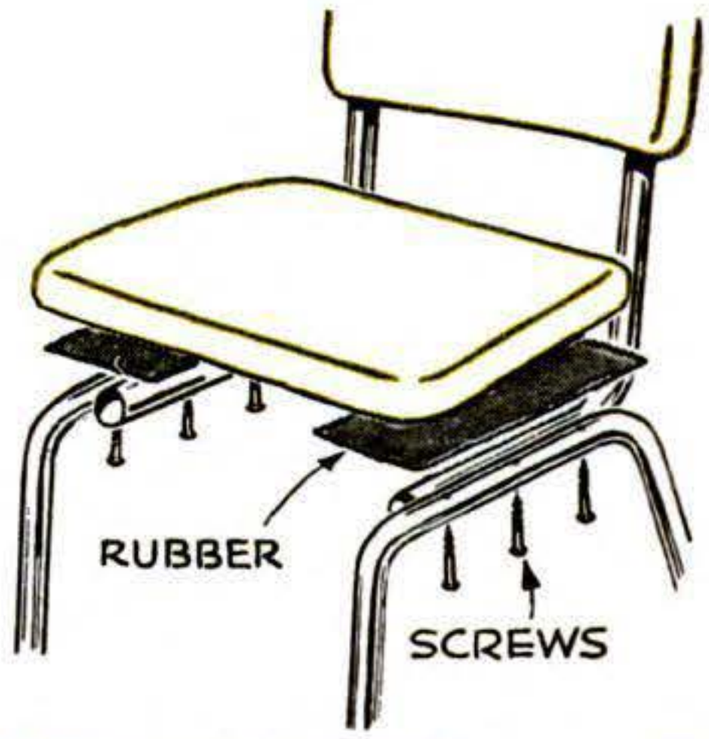
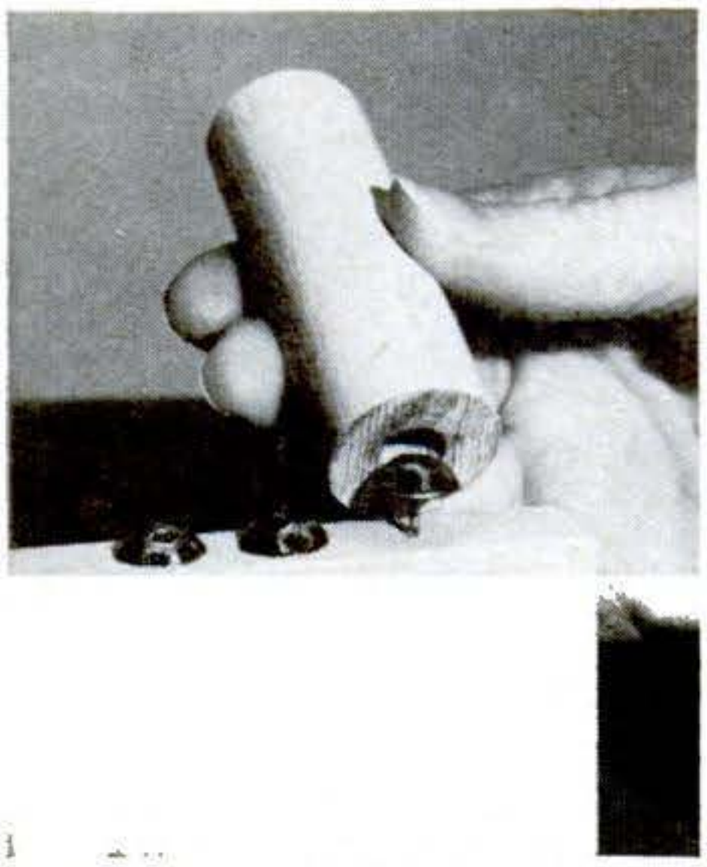
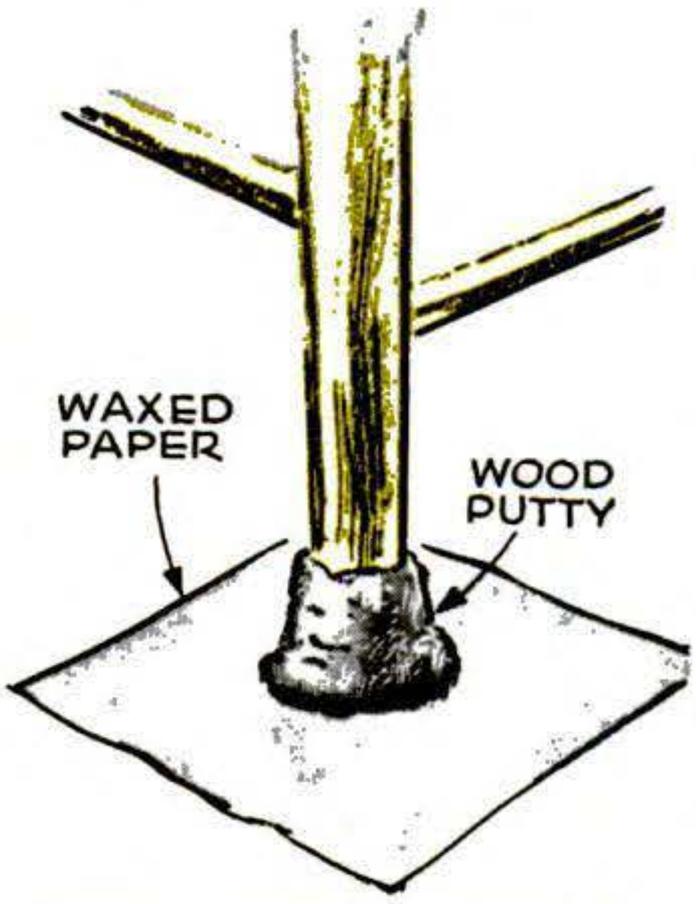
7 Quick Tips for Chair Repair



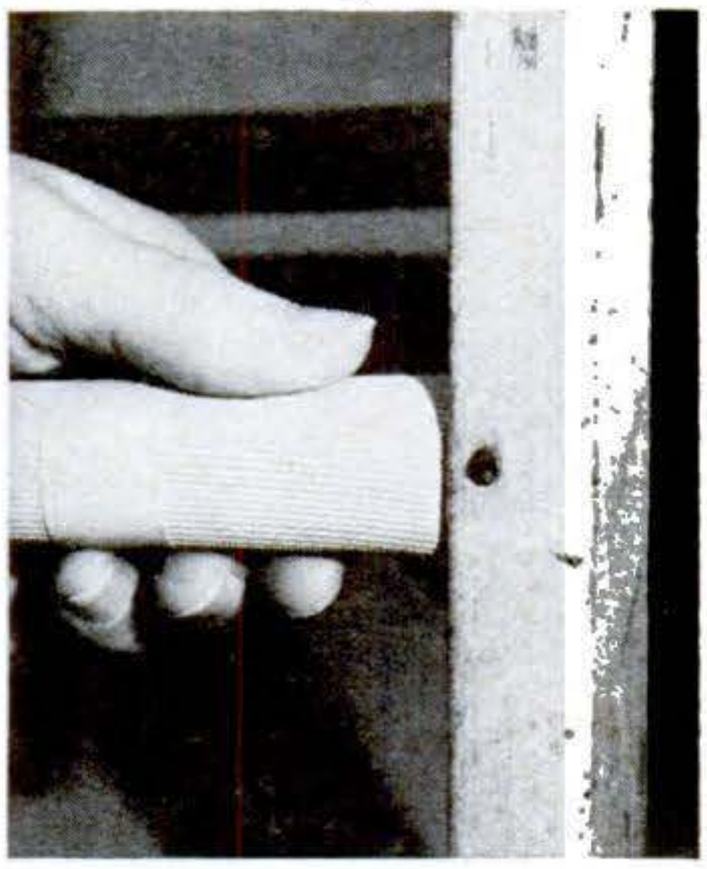
SQUEAKS MAY OCCUR when the seat rubs against the frame of a tubular chair. One fix: inner-tube rubber between seat and frame.



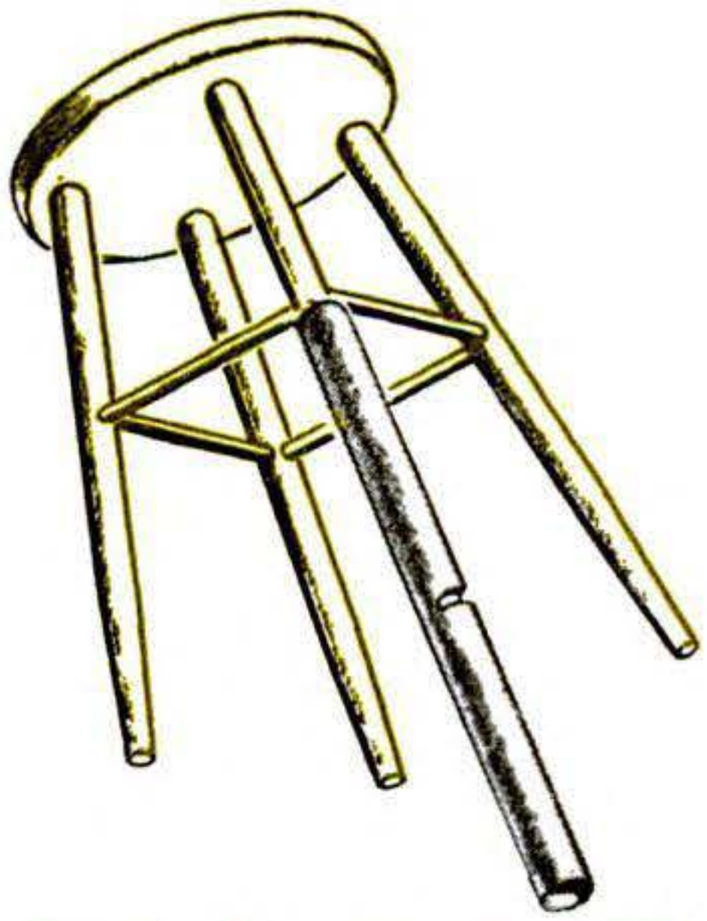
DECORATIVE UPHOLSTERY TACKS can be driven without damage to the head if you use this tool: a short piece of broomstick with a hole drilled in one end.



LEVEL A WOBBLY CHAIR by putting a gob of wood putty on waxed paper on a level floor. Press the short leg into putty until it is even with the other legs. Trim off excess putty, sand smooth.

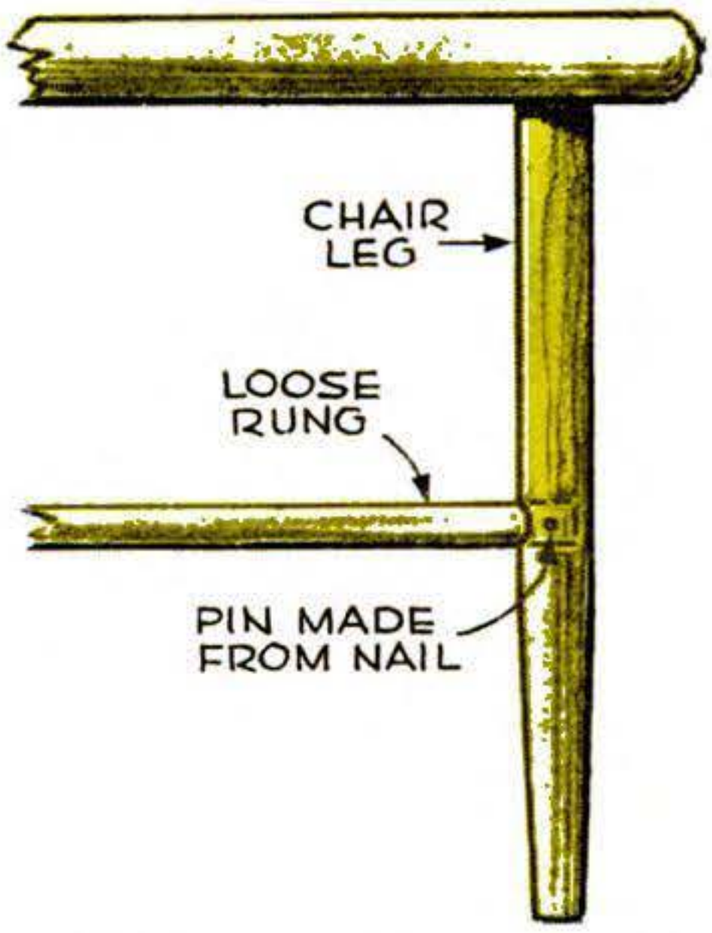


RUNGS SHABBY because growing youngsters hook their feet and heels over them? Slit a piece of large-diameter hose lengthwise, slip it over rung, and fasten with bands of tape.



CUTTING OFF LEGS of a stool or chair? A mailing tube will help you get a level job. Measure off desired leg length on tube and saw part way through at this point. Slide the tube over each leg in turn and use the kerf on the tube as a guide as you saw off the leg.

FOR A DAMP SPOT where legs of chairs and tables may rot away, nail or screw small blocks of wood to the legs as shown in photo above.



TO TIGHTEN A LOOSE RUNG when all others in the chair are snug, push the loose joint together, drill through it with a small nail, cutting off the nail so that it will be below surface on both sides of the leg. Then fill the holes with putty.

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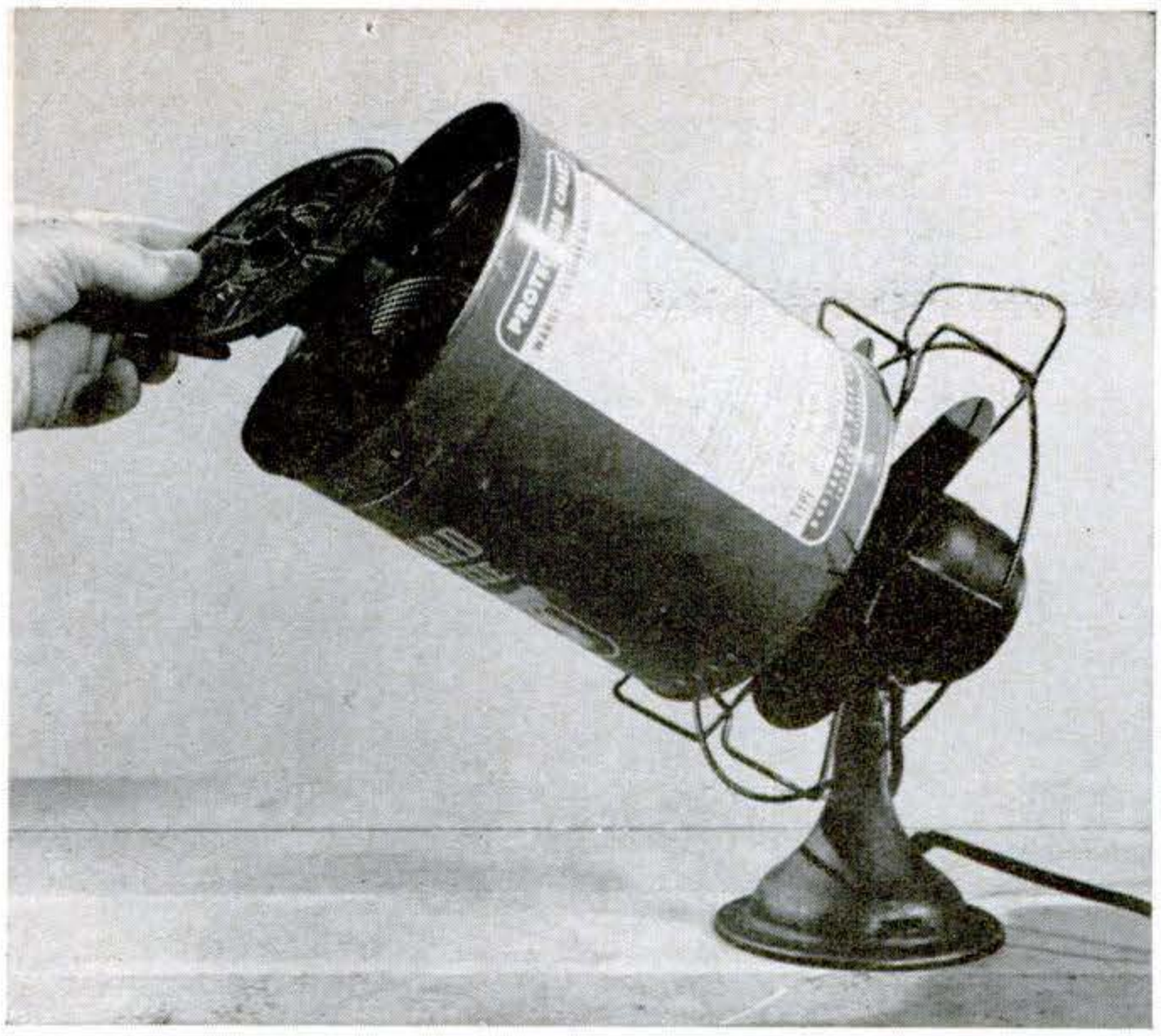


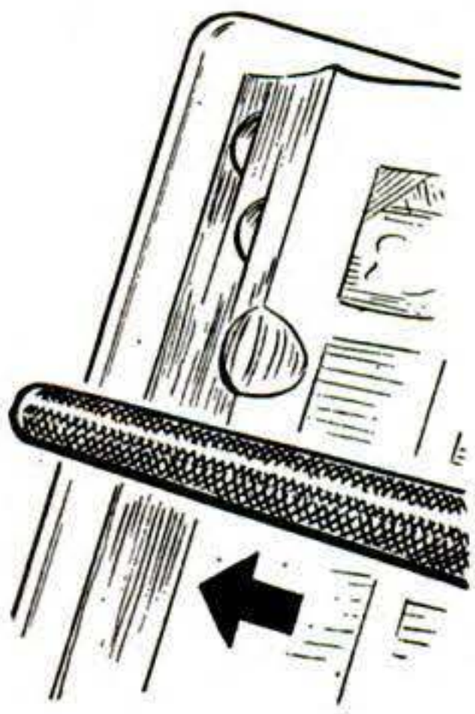
Short Cuts and Tips

FROM PS READERS

Fan Hood Dries and Defrosts

WET parts such as film-developing reels will dry completely in a few minutes when dropped into this fan hood. Frozen-food packages will defrost in half the normal time. Just cut the top and bottom from a one-gallon can and wire the can to the blade guard on any electric fan.—*Murray Kent, Detroit.*

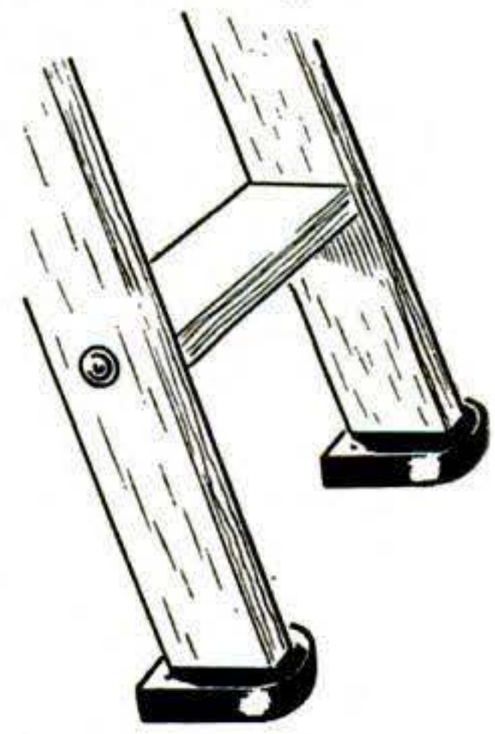
Thumb-Indexing Book Pages

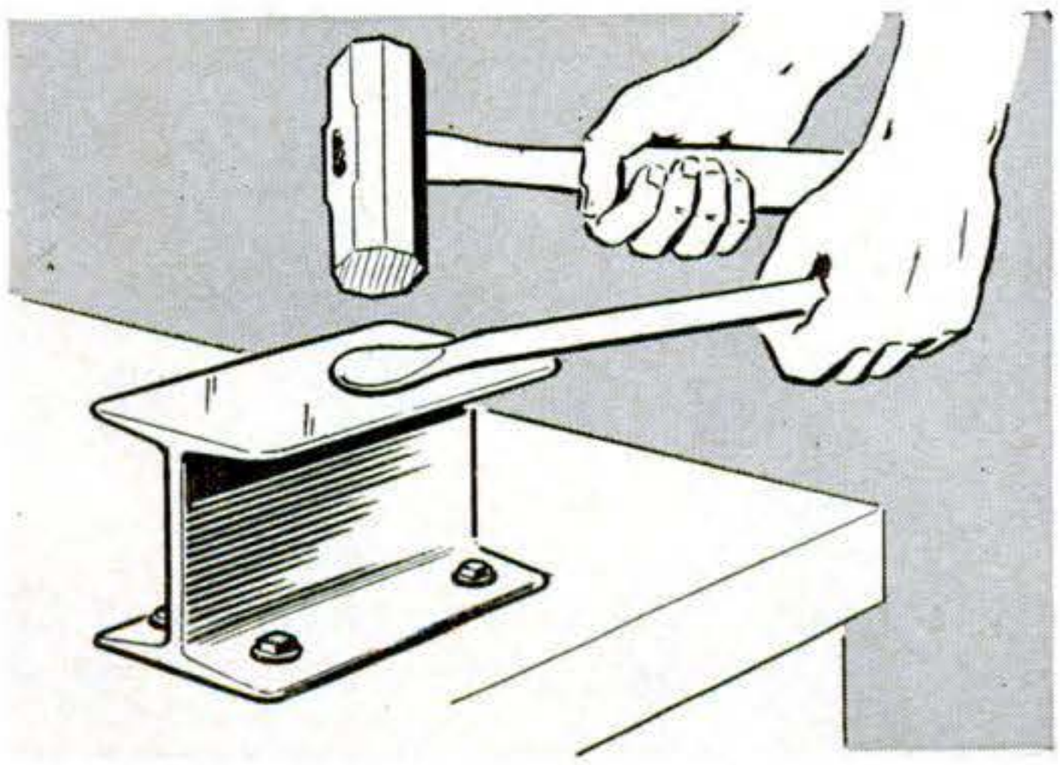


I USE a finetooth rattail file to make index notches in the edges of my reference books, including bound copies of PS. A number of light strokes inclined at a 45-degree angle form tapered thumb holes.—*Fred Duncan, Moorestown, N. J.*

"Feet" Prevent Ladder Slip

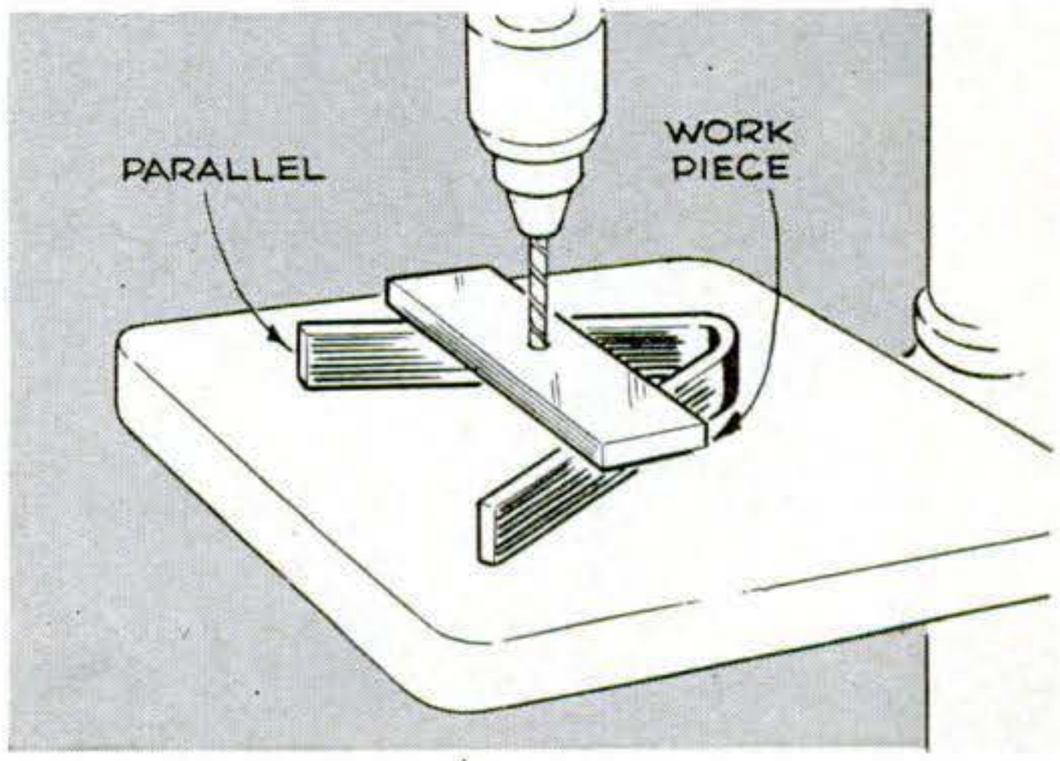
RUBBER shoe heels nailed to the bottom of a stepladder will steady the legs on highly polished floors and prevent their marring the finish. Drive the nails in the heel holes to sink the heads.—*George Knowlton, Swampscott, Mass.*





Low-Cost Anvil from I-Beam

IN MY shop, I have only occasional need for an anvil—not enough to buy one. For these occasions, I bolted a foot of 8" I-beam to the top of my bench. A piece like this can be picked up at a junk yard for little or nothing.—*Joseph D. Campbell, East Alton, Ill.*



Parallel for Drill Press

A FIRM parallel support for elevating work above the drill-press table can be bent from a strip of 1/8"-by-1 1/2" steel. If the edges of the strip bulge where you bend it, file them flush with the straight parts. Being one piece, this parallel won't rock or tip.—*F. Murray, Chicago.*

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Simple rules of eye comfort:

Arranging Your Shop

Why This Article Is Important

Eye comfort in a shop is more than just a matter of working efficiency. It's a matter of safety, too. And where close work is necessary, as it is in virtually every shop, it is vital to eye preservation.

Dr. Gregg, author of this article, was a member of a research team that made a two-year study of more than 200 occupations and avocations to determine the visual needs of each.

"We found that hobbyists in their home workshops have intense and unusual seeing problems," says Dr. Gregg. He adds: "And we found that these problems are seldom solved satisfactorily."

Dr. Gregg is a former president of the California Optometric Association. Currently, he is an associate professor at the Los Angeles College of Optometry.

By James R. Gregg, O.D.

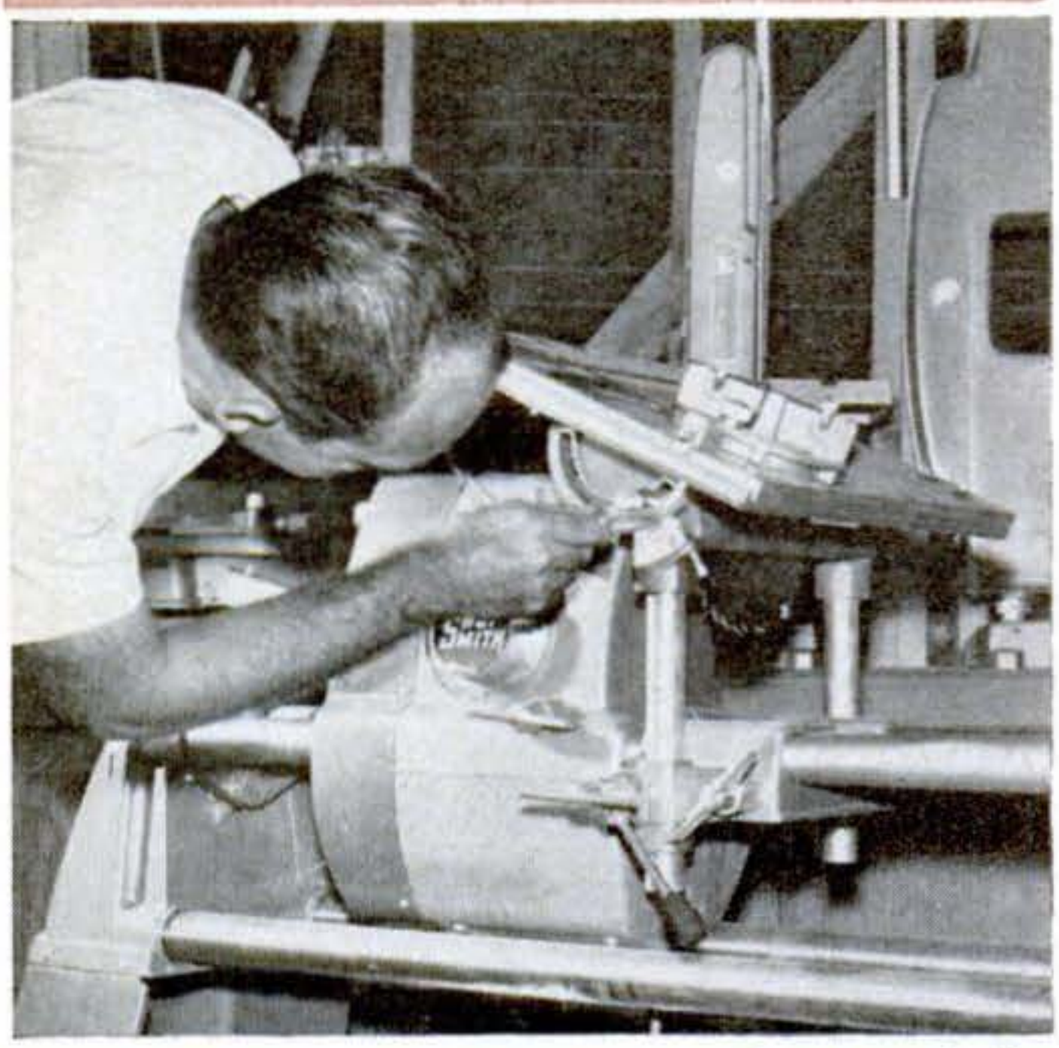
EYESIGHT is your most valuable shop tool. But chances are it is neglected unless you give attention to how well your work area is designed for seeing.

If your eyes can do their job with ease, your hobby will be more fun—and more profitable, too—because you'll work with less error and fatigue. Here are some tips for better seeing in a shop:

Use balanced lighting. Two kinds of light are necessary for good seeing—specific light right on the work and general room illumination. Eyes that have to adjust from high brightness one moment to dimness the next will tire quickly.

A bright spotlight on the work with the rest of the room dark—a common shop situation—causes strain and fatigue. Be sure the entire room is illuminated.

Get enough light. The central working area, a bench or a machine, needs at



OPERATING HIDDEN CONTROLS is one of the toughest shop jobs. It's especially hard with bifocals because you must bend low and arch head back to see. Good lighting on tools, as here, helps whether or not you wear glasses.

Good lighting pays off

DON'T WORK IN YOUR OWN SHADOW. Conventional ceiling fixtures are often low and behind you, don't light a bench well. Hang extra lamps, preferably adjustable so you can raise and lower them, directly over work areas.

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for Better Seeing

least 20 to 30 foot-candles of light. That's about the amount supplied by an uncovered 100-watt bulb 3½′ to 4′ away. In a lamp at ceiling level, it may take 200 watts or more to give the same lighting.

General room illumination is seldom high enough for critical seeing jobs. It is best to have an adjustable lamp right over the work area as well. It doesn't matter what kind of light you use—incandescent or fluorescent—so long as there is enough of it.

Eliminate glare. Glare is as bad as not enough light. Eyes are attracted to bright areas and can't concentrate.

Exposed bulbs, found in many home shops, should be shaded. Most modern lamps with built-in bulb covers and reflecting shields minimize glare. Shiny surfaces, overly bright windows and any other distracting sources of glare should be eliminated. Indirect lighting, although often expensive, is the best for reducing shadows and glare.

Paint surfaces light. Unpainted surfaces, whether wood or concrete, are generally too dark and don't reflect enough light. Use light-colored paints on walls, ceilings, floors and benches to diffuse and distribute more light throughout the room. The colors you choose aren't important so long as they're light; but use flat, dull finishes to prevent glare.

Your central working area should never be more than three times brighter than the surrounding area. A shiny metal part on a dark bench or machine will be too much brighter than its background. A light paint job brightens surrounding areas and keeps down too much contrast.

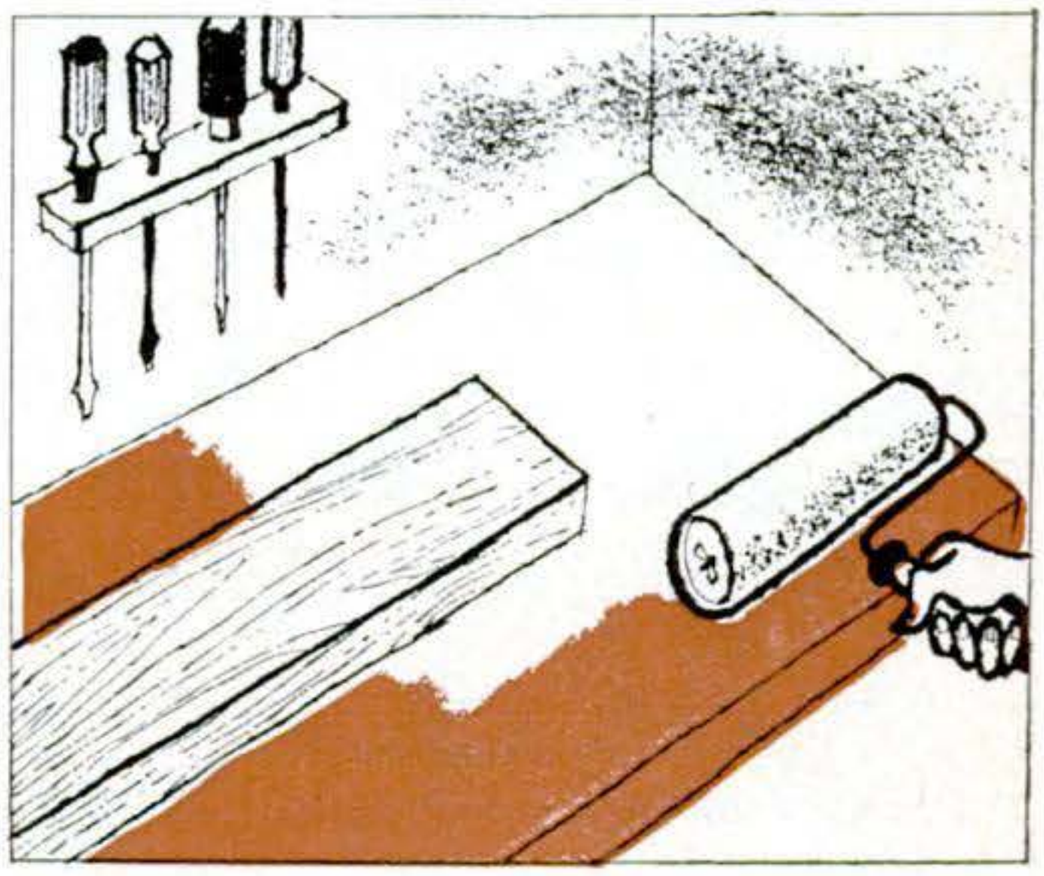
Center your work. Eyes work best if each one sees the job at the same distance, with the work centered instead of off to one side.

Normal reading position illustrates this nicely: The book is centered on the body, well below eye level, and is tilted so the page is nearly perpendicular to the line

in greater accuracy, less strain

TOO MUCH CONTRAST between a bright spotlight on the work and a dimly lit room causes eyes to strain in abrupt switch from light to dark areas. Provide a high level of general illumination as well as lamps for specific jobs.

PAINT WALLS AND WORK SURFACES in light colors so they more closely match your work—usually light-colored wood or metal. This lessens eye strain from excessive contrast between light and dark areas, also brightens the shop.



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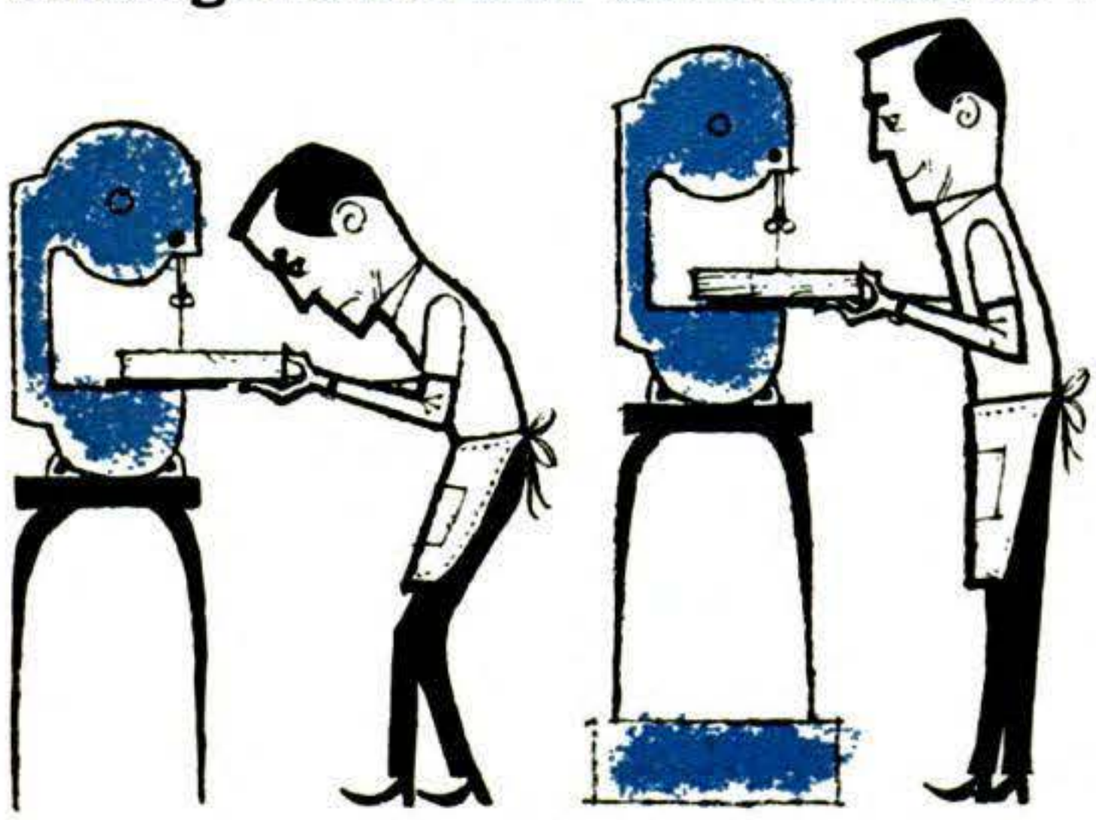
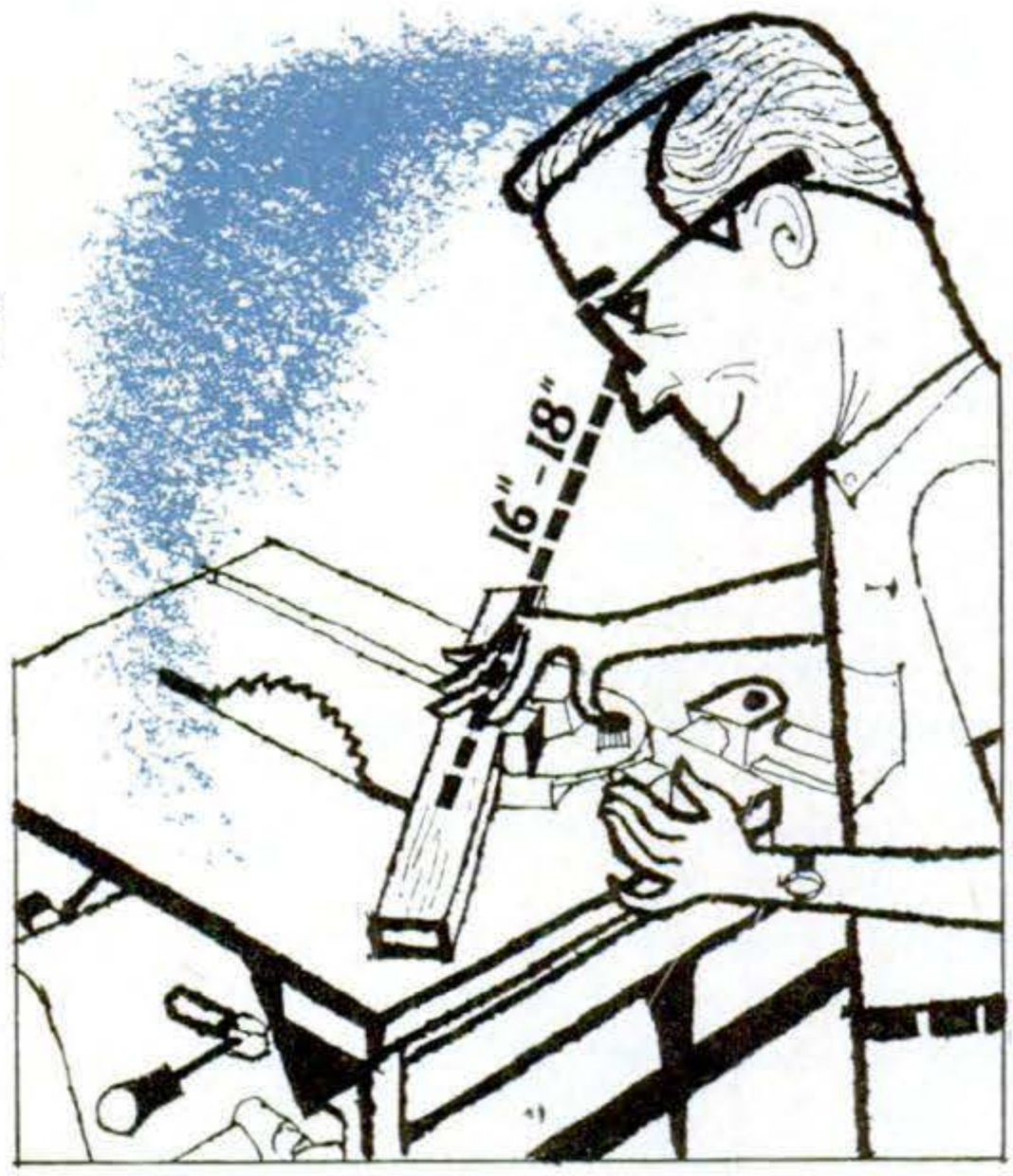
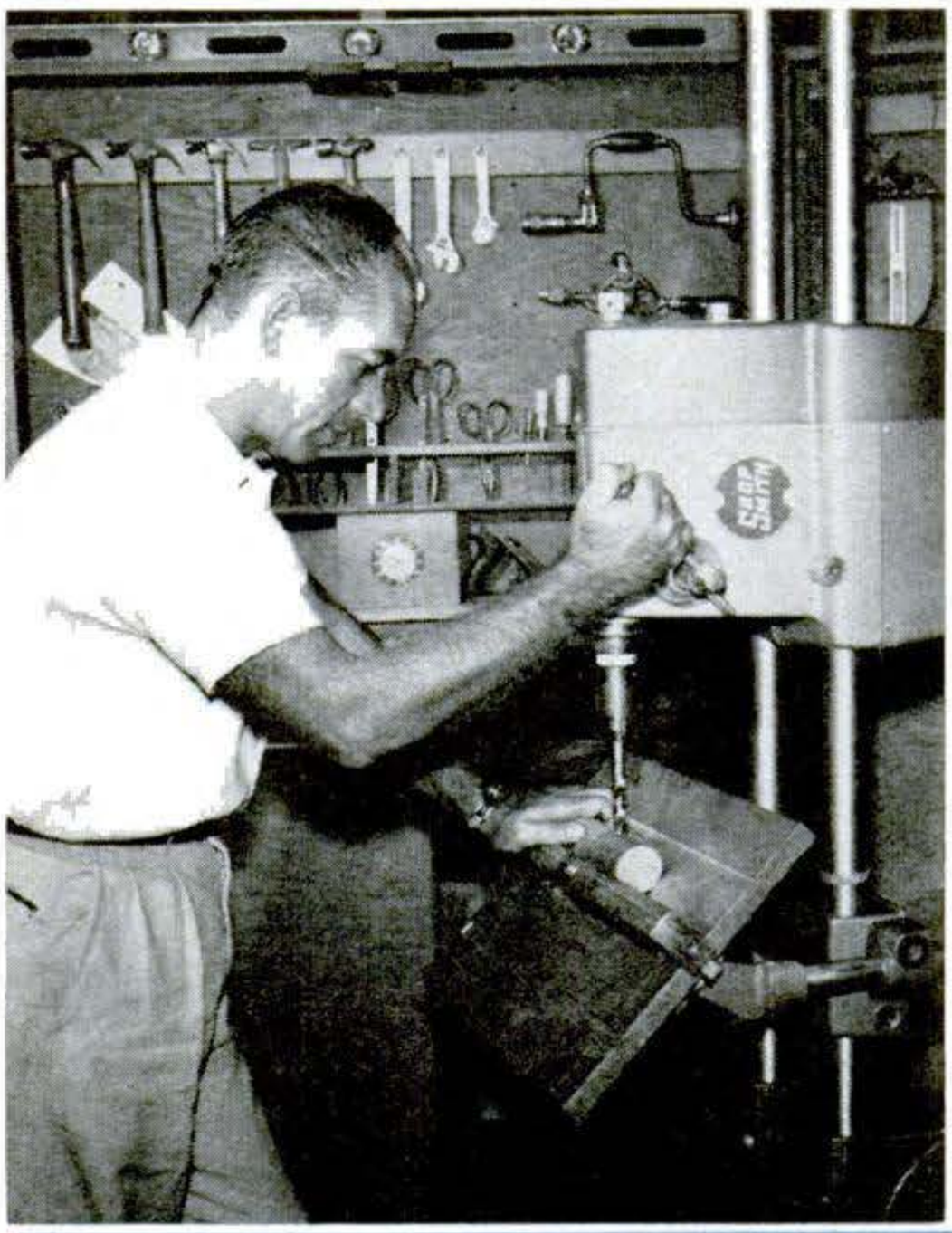
Arrange tools and work areas to match your best eye-distance

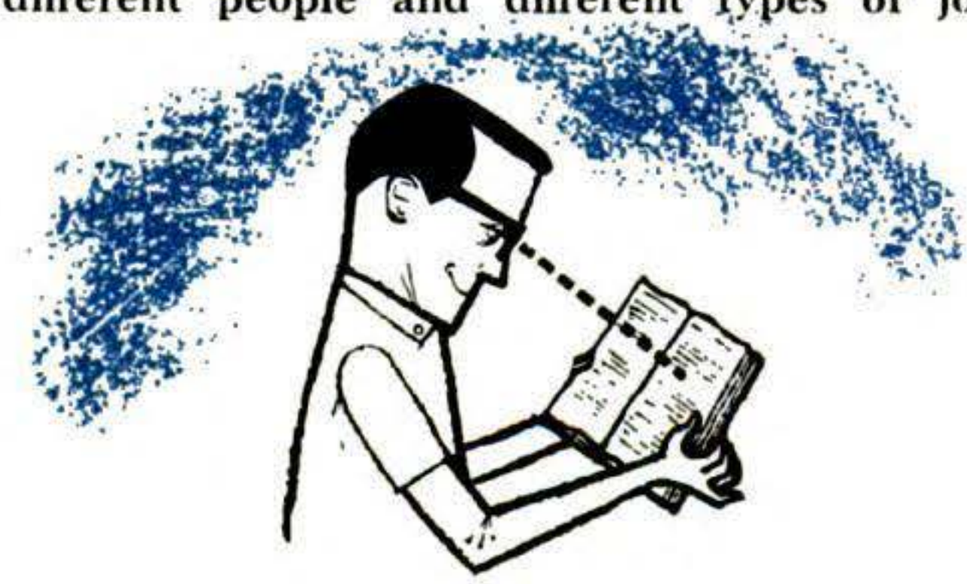


TOOLS COME IN STANDARD HEIGHTS—people don't. A work surface that's too low will cause tiring stoop and squint; if too high, work will be too close for comfortable seeing and cause awkward back-tilt of your head. Once you've found the working distance that's right for you, adjust work tables and benches to proper height by blocking them up or cutting them down.



FIND YOUR BEST WORKING DISTANCE by having a helper measure while you try out most comfortable positions. Take an average of five tries for final measurement. The usual working distance is 16″ to 18″ but it can vary widely for different people and different types of jobs.





BEST SEEING POSITION is with work centered in slightly downward direction so both eyes see it from the same distance and head tilts comfortably, as at left. Note how this is almost identical to the way you hold book (above) for easy reading. For wearers of bifocals, this puts work where it can be seen through lower lenses.

of sight. Tables, jigs, benches, and machines should be adjustable to approximate the normal reading position, even tilted when this is possible.

Power tools are standardized at 36″ to 40″ high. But home craftsmen don't come in standardized sizes. Whether you stand or use a stool, have the work area adjustable so that it is not necessary to bend over to see at *your* comfortable seeing distance. You can work and see in an abnormal position briefly, but if you stay at it, adjust the work to suit your personal habits.

Store tools for best visibility. Whether or not you wear glasses now, somewhere

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in your forties you'll have difficulty seeing up close. This is because the eyes lose their normal ability to focus on near objects—and it happens to just about everybody. Eventually this leads to reading glasses or bifocals. Once this happens, most glasses won't solve all the problems of reading labels, selecting small parts, or seeing accurately in a wide variety of locations—especially if the glasses were made for another job.

You can minimize this difficulty by proper arrangement of your shop. Keep small tools and parts on shelves or in drawers within easy arm's reach and never above eye level. Print labels large.

The most difficult seeing area after your mid-forties will be above eye level and farther away than 24″ to 36″. Put large tools in this "difficult" area—you'll always be able to see them, even if not perfectly clearly. Keep small objects low and close where they can be spotted

[Continued on page 242]

Are Your Eyes Up to the Job?

IT TAKES more than 20/20 vision for good seeing in the shop. Eyes must focus strongly, sharply and without tiring, for accurate detail work.

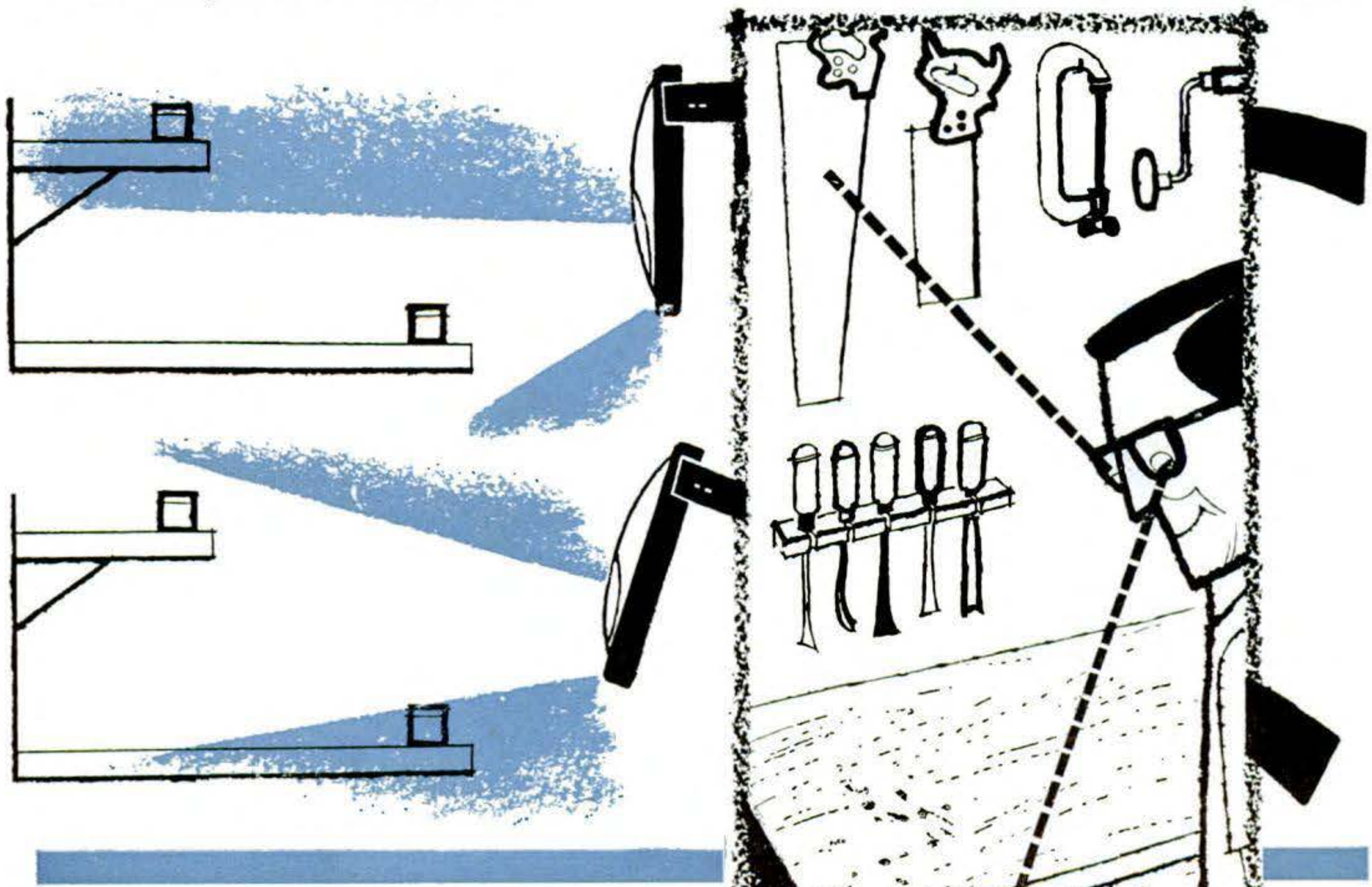
Any of the following signs may indicate deficient eyesight for shopwork and should be investigated immediately:

- **Blurred vision of near objects.**
- **Headache or tiredness associated with use of the eyes.**
- **Double vision.**
- **Inability to line things up or judge distance.**
- **Errors in cutting, sawing, measuring, or frequent mistakes of any kind.**
- **Listlessness and loss of interest.**

How to live with bifocals in a home shop

THE PROBLEM: Small objects viewed close, especially fine print, must be seen through the lower lenses—yet the equipment in many shops in effect is arranged topsy-turvy, with tiny parts kept high on shelves or in jars against the ceiling. This forces the bifocal wearer to strain upward and tilt the head awkwardly back to bring the small objects into correct focus.

THE SOLUTION: Keep small parts on the lowest shelves, in bins built along the front edge of a bench and in drawers underneath. You need only look down, without moving your head, to see them clearly through the lower lenses. Store large tools high and at back of bench where you can spot them, even if not clearly, through distance lenses in upper part of the glasses.



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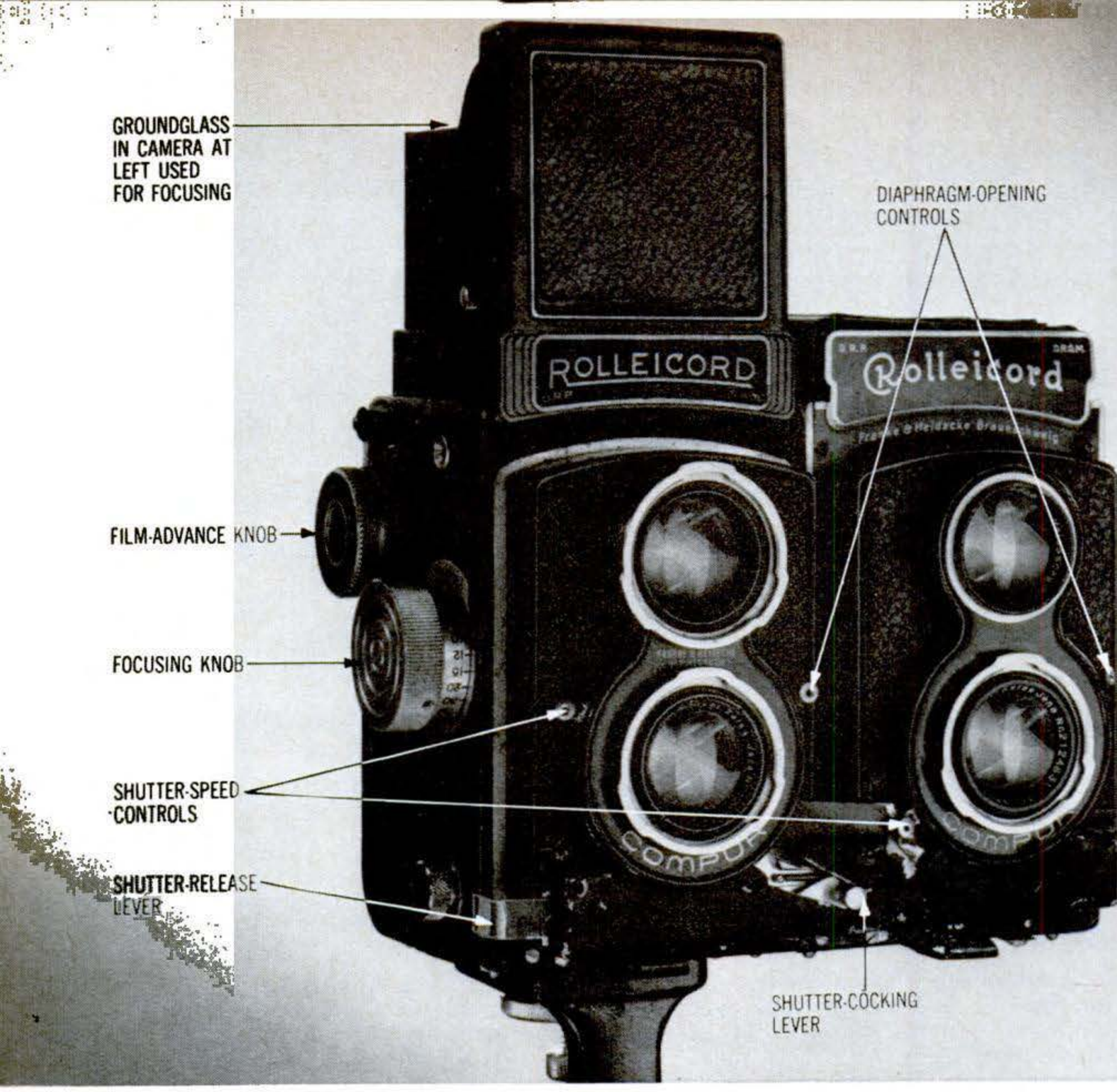
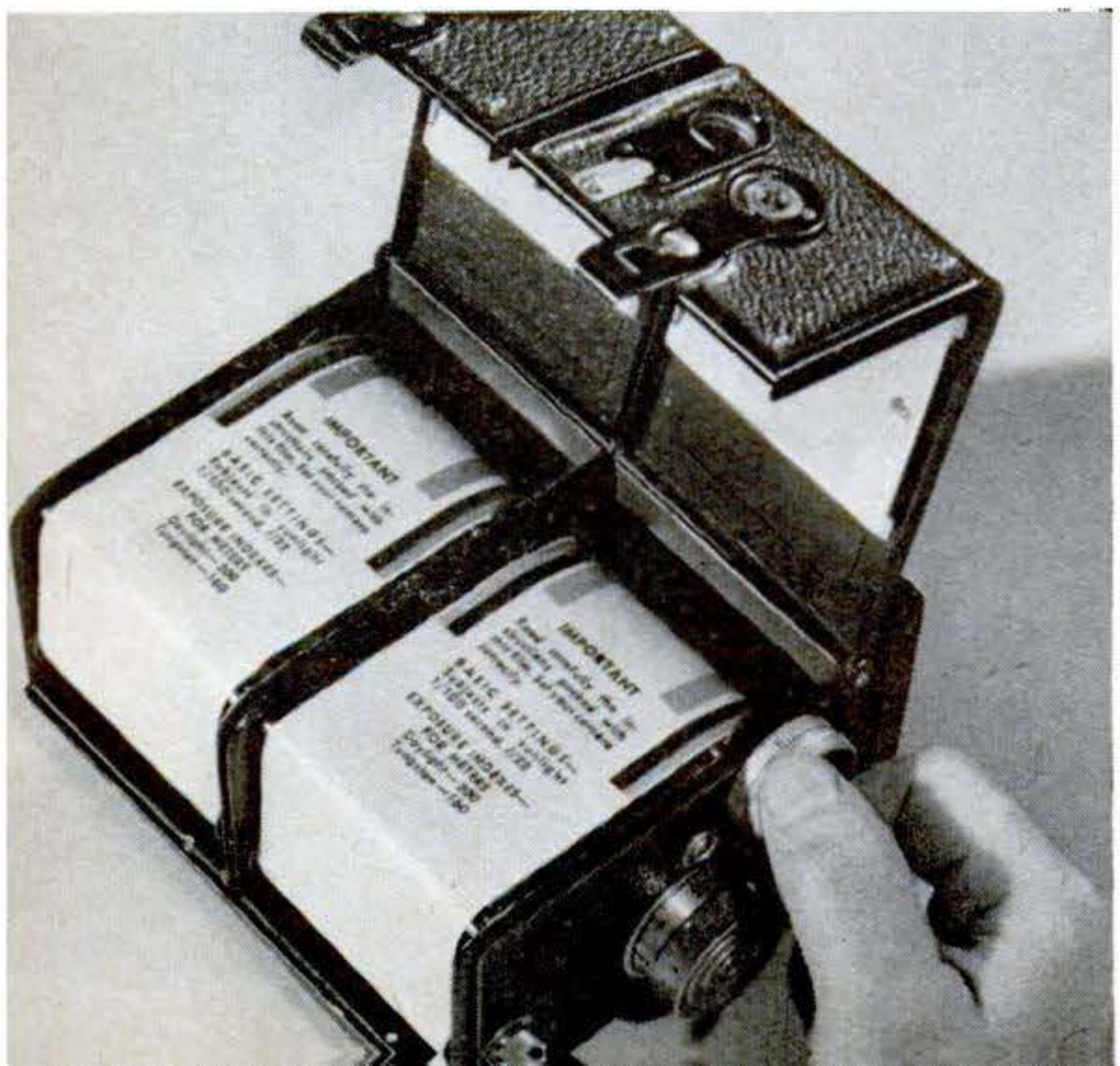


Siamese Cameras Double Your Chances

FILM IS ADVANCED in both cameras by turning a single knob. A coupling shaft, passing through light-tight bushings in the sides of the paired cameras, joins the two winding posts.



A RIG that pro photographers will find more useful than an extra pair of hands has been devised by a camera repairman. It's a brace of cameras interconnected so they operate as one.

Only the shutter speeds and diaphragm openings are changed individually; other controls are coupled for single-knob operation. With the Siamese-twin cameras you can simultaneously shoot:

- Color and black-and-white
- Fast and slow (fine-grain) b. & w.
- With and without a filter
- At different shutter speeds
- At different diaphragm openings

Fred Weiner of Photokraft Co., 133 East 43 Street, NYC, got the idea from listening to his professional customers, many of them magazine photographers.

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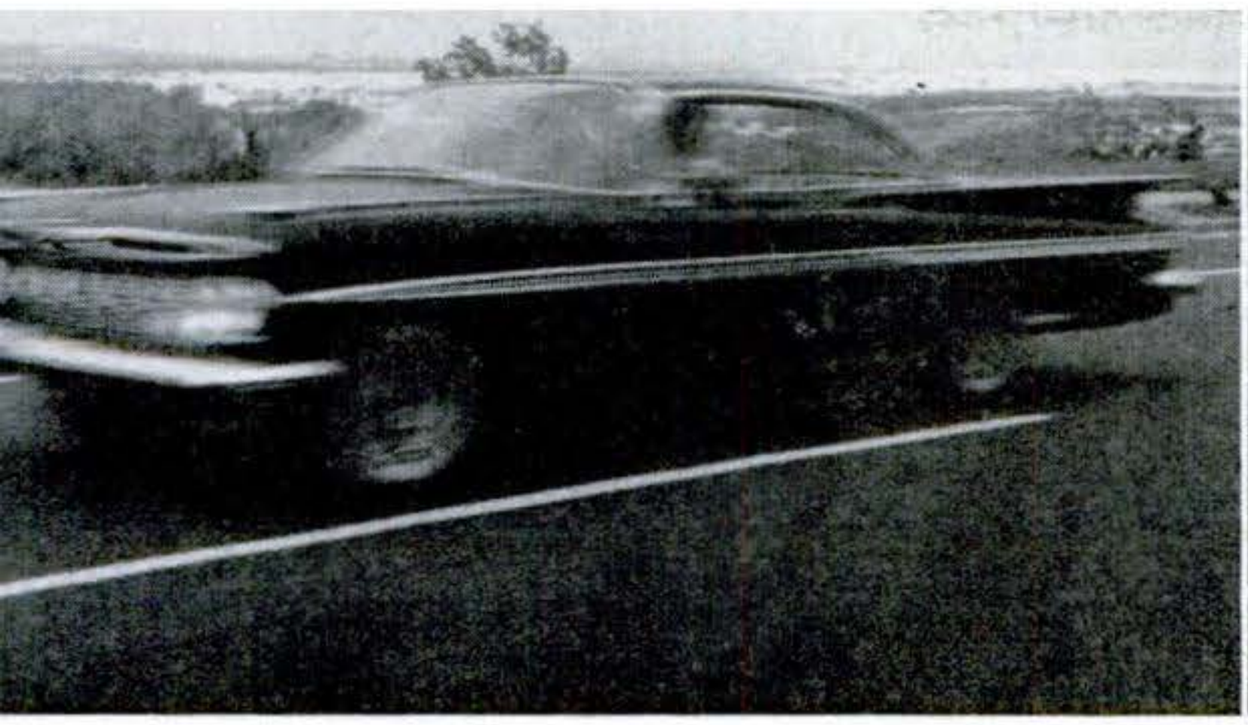
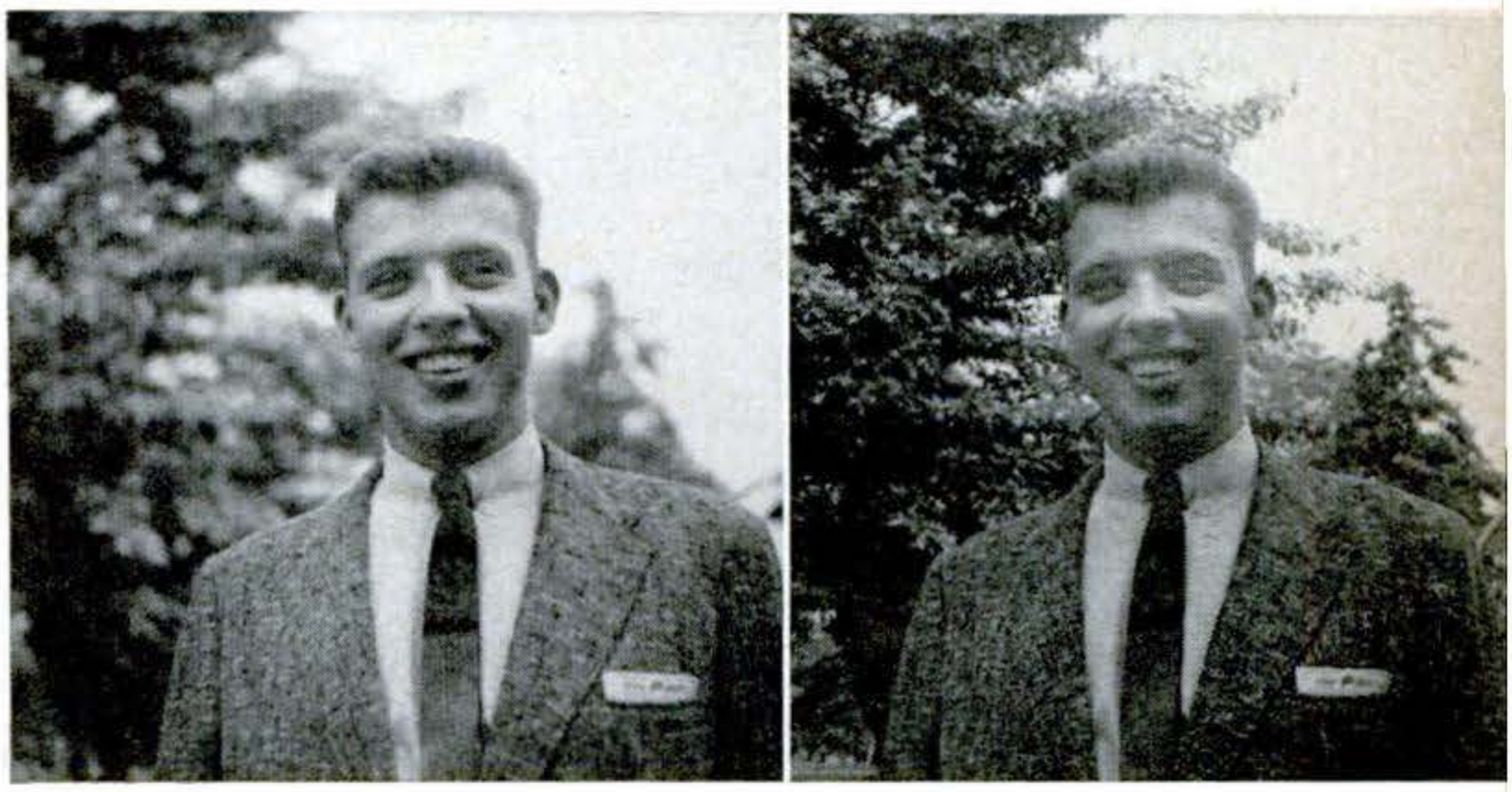


DIFFERENT SHUTTER SPEEDS used in snapping a moving object give photographer a choice between varying amounts of blur. A single click caught this car at 1/100 sec. and at 1/300 sec.

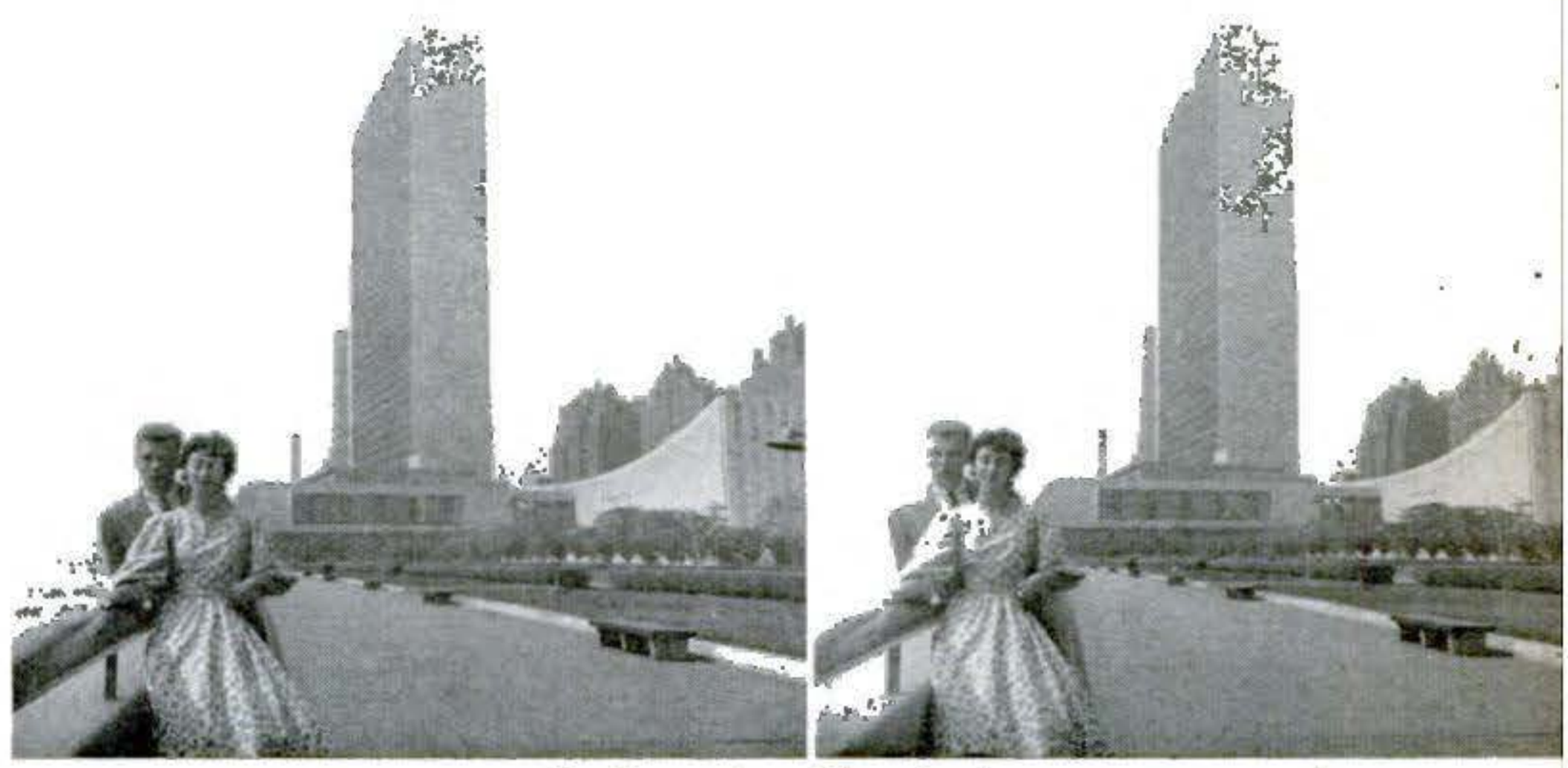
He chose Rolleicords because they're well-made, and prewar models because they're simpler than more recent ones.

Strobe can be plugged into one set of external connections. The two shutters are so synchronized, however, that even at different speeds, the light source is triggered only when both are open.

Weiner had a combination of color and b. & w. in mind when he made the rig. But he also knew that pros shoot a scene with various speed and opening combinations if they can. Because the dual camera doubles the number of pictures taken, there's less chance of missing those extra, "safety" shots. It's especially useful in photographing motion: Getting just the right amount of blur often takes trial shots at a range of shutter speeds. If the picture is staged, you must rerun the action completely for each shot—which takes time.



DIFFERENT LENS OPENINGS produced a soft-focus and a sharp-focus portrait at the same time. The lens on the left-hand camera was opened wide; the other was stopped down to f/16.



STEREO PRINTS were made by using identical exposures on the same kind of film. The unintentional bonus resulted from angling cameras together slightly to correct for parallax.

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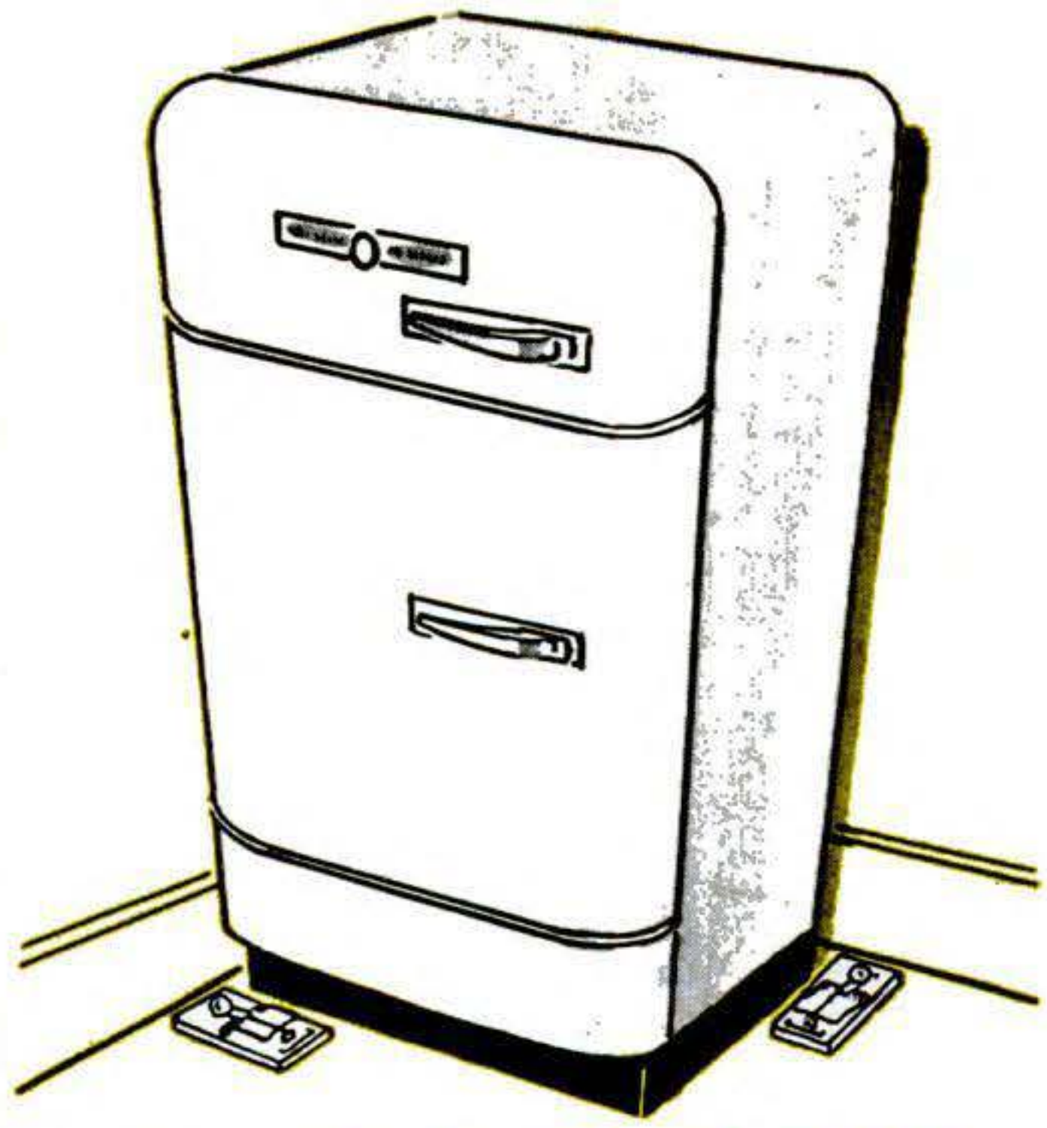
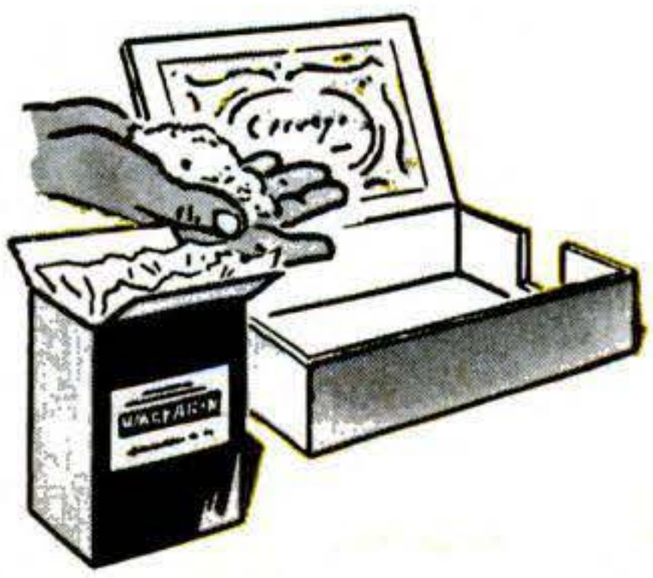
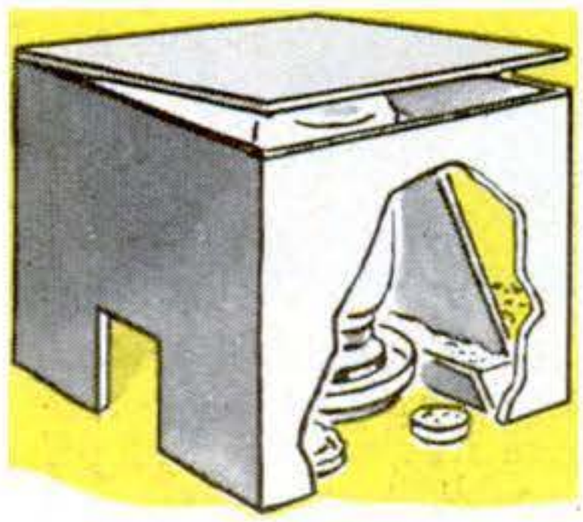
Tips on Getting Rid of Mice

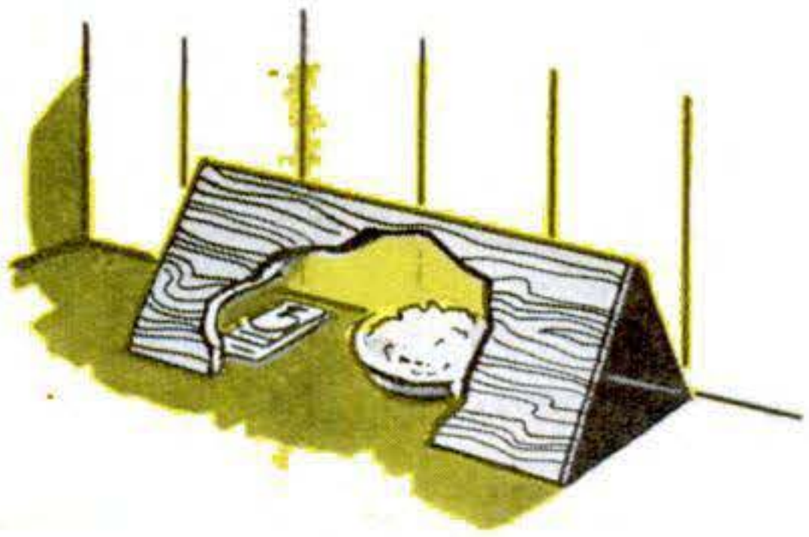
A BOOKLET on mice control put out by the Alumni Research Foundation of the University of Wisconsin recommends a double-barreled approach—simultaneous use of traps and anticoagulant baits. Copies are free from the Foundation, Box 2217, Madison, Wis.



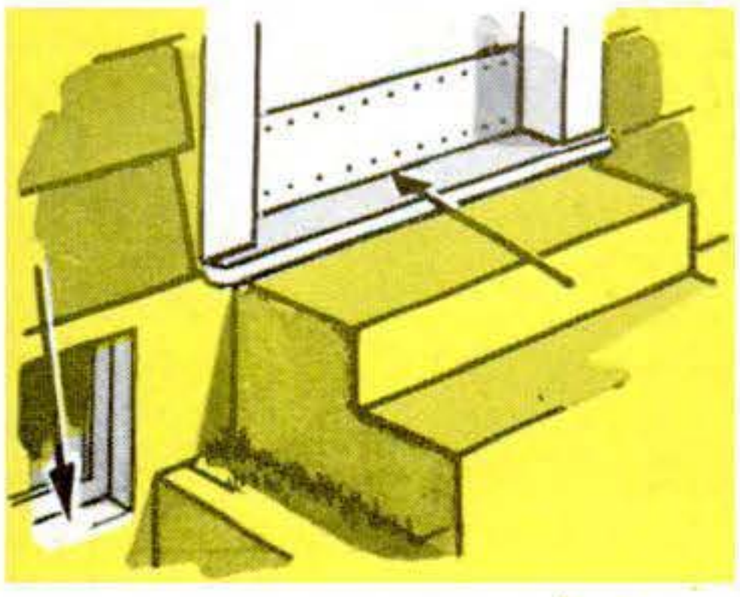
PLACE TRAPS SO MICE HIT TRIGGER whichever way they approach in runway. This usually means putting it crosswise in runway. Bait for the traps? Just about any food—or use a piece of cotton. (Mice like it for nest making.)

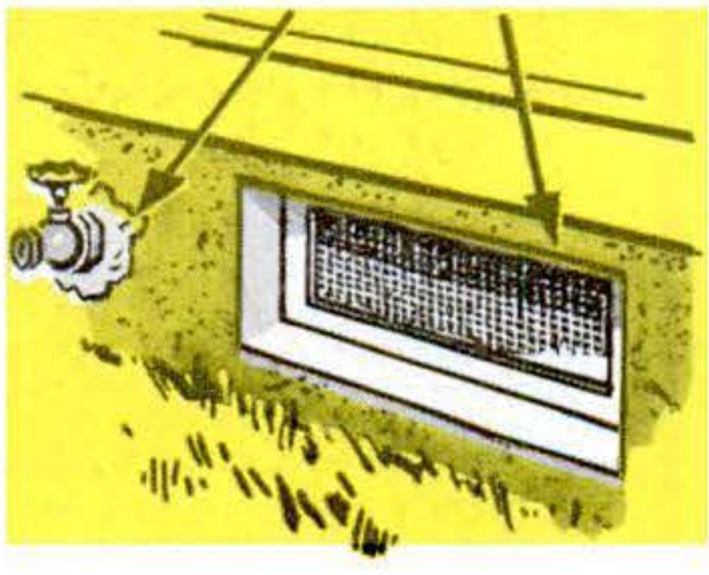






SAFEST BAIT is an anticoagulant such as warfarin, discovered at the University of Wisconsin and now available under various trade names in your local stores. It comes in two forms—ready-mixed in cereal, and water-soluble. Illustrated here are ways you might use both types. Cut a doorway in one or both ends of cigar box, drop in a handful of cereal bait. Or place both types of bait in a self-feeder box, center. Right, a lean-to protects bait and trap. Warfarin-weakened mice are easily caught, reducing chance of dead-mouse odor in the house.





KEEP MICE OUT of house by making sure that windows and doors near ground level fit tightly. Use metal flashing at door bottoms. Make the doors self-closing. And cover all openings around pipes and foundation with cement or ¼"-mesh wire screening (hardware cloth).

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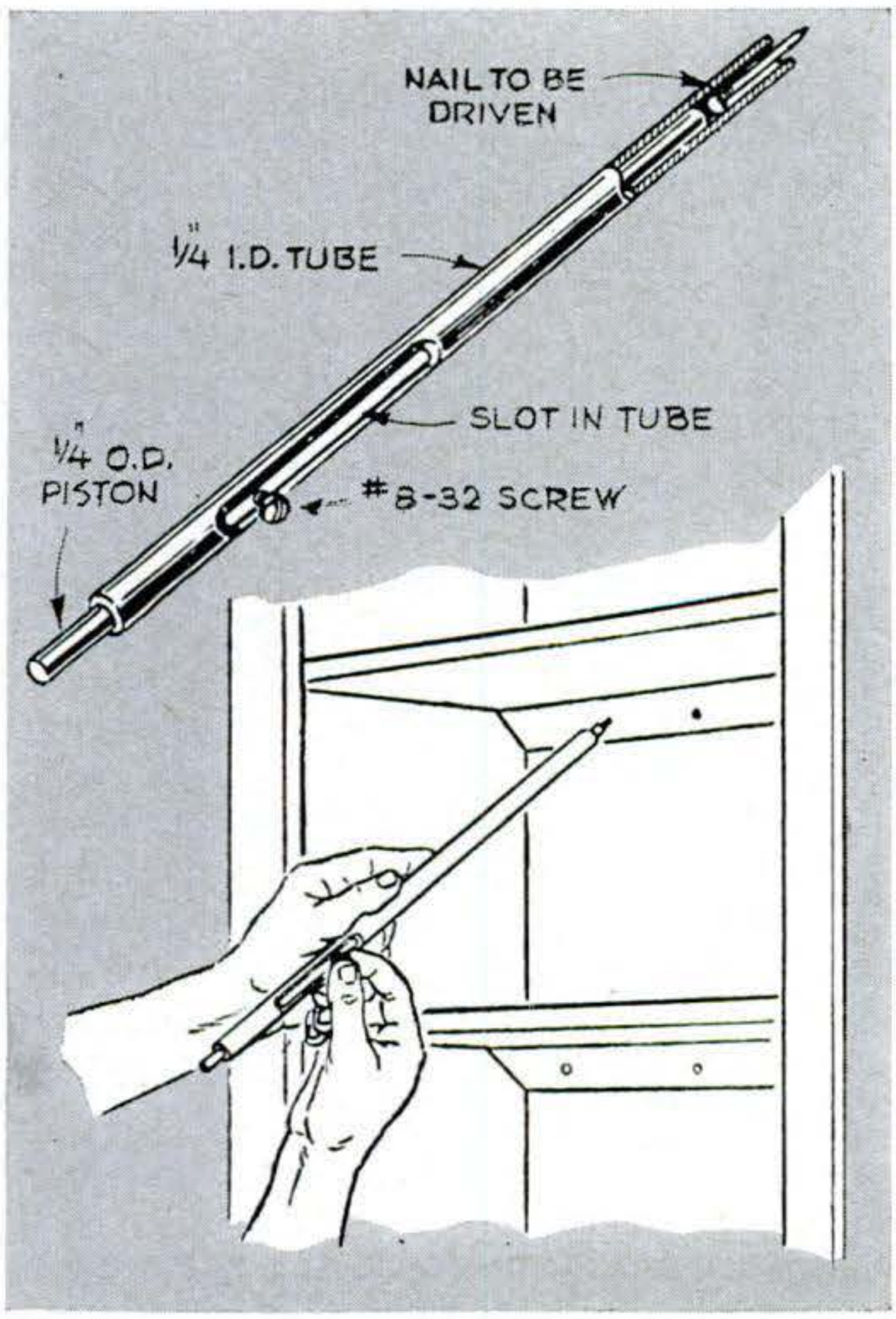
Short Cuts and Tips

FROM PS READERS

Steel Ball Keeps Spray Paint Mixed

A GOOD-SIZE ball bearing dropped in the paint cup will help prevent paint from settling while you're spraying. The side-to-side movement as the gun is used will keep the ball in motion, agitating the paint.—*Ken Murray, Colon, Mich.*

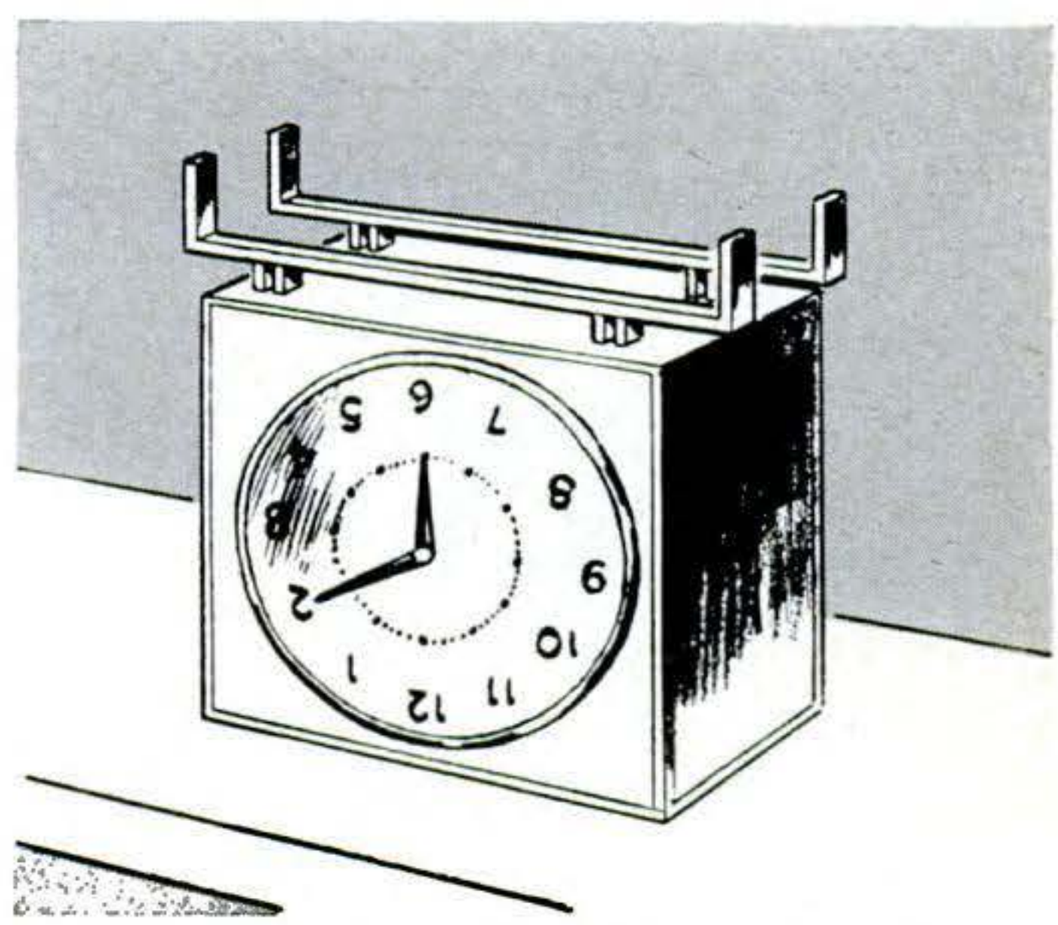


Tube Shoots Nails Into Corners

THE piston inside the nail shooter shown in the sketch above will drive home nails in places where there's no room to swing a hammer. The tube holds the nail.—*Cecil F. Cooper, Morehead, Ky.*

▶▶▶HOLLY wreaths and decorations will last longer and have more luster if you give them a thin coat of synthetic resin sealer or spray-can plastic.

▶▶▶EVEN when my auto is exposed to sub-zero temperatures in the carport, I have no trouble with cold starts. What does the trick is a vent leading from our clothes dryer out through the house wall, close to the engine. On frigid days I turn on the dryer for a few minutes, and the warm-air exhaust gives the starter just the encouragement it needs to turn over. —*James D. Feldman, Park Forest, Ill.*



Cure for Noisy Electric Clock

YOU often can quiet a noisy electric clock by turning it upside down for a day. This recirculates settled oil. If that doesn't work, remove the gear unit. Warm it slightly, put a drop of oil in the shaft cup, and place it in the refrigerator for about five minutes. Cooling the air within the unit draws the oil in. When the clock is connected, this oil circulates.—*Edward Bentley, Jackson, Mich.*

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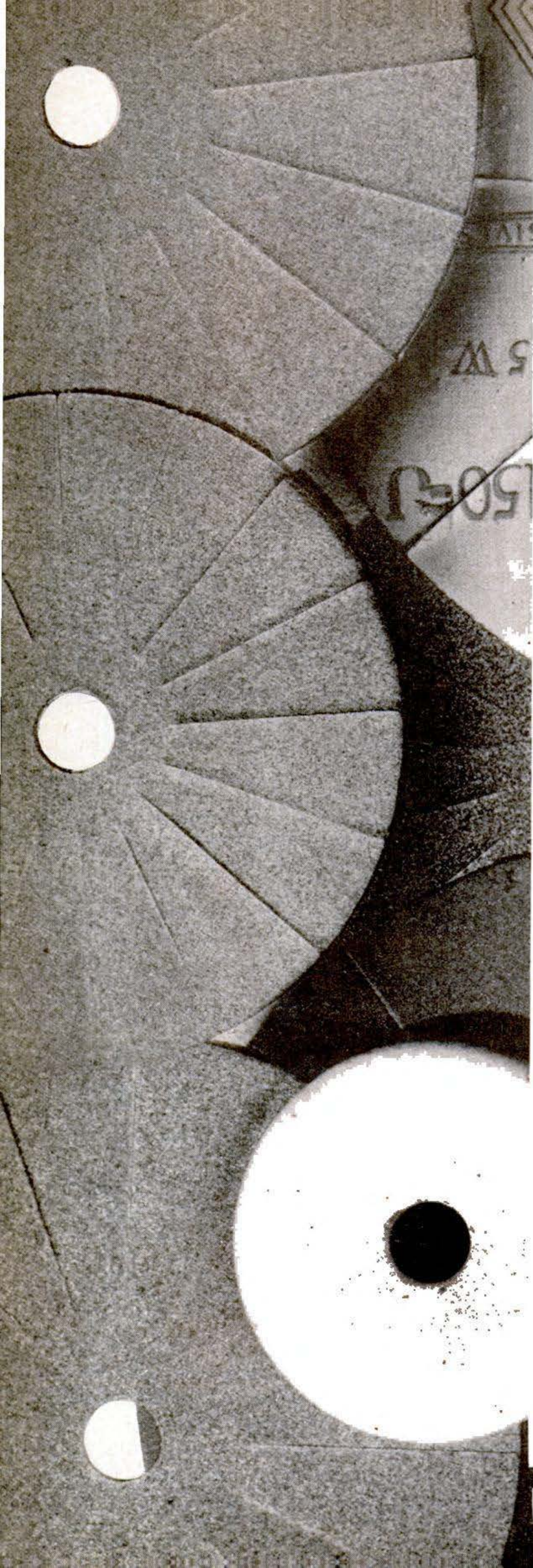


Introducing an important

Sanding

By Jerry Parker

YOU can add a new power tool to your shop for less than a quarter, thanks to the first really new development in sanding in a long, long time. It's the radially slotted sanding disk.

It turns a tiresome task—hand sanding odd shapes, moldings and flutings—into a fast power job. Best of all, flutter and spool sanding (the two slotted-disk techniques) work with power tools already present in many home shops. You need buy only the disks themselves.

The disks have a special backing, flexed during manufacture so they'll be pliable enough to stand up during use. Either eight or 16 cuts run from the outer edge of a disk nearly to the center.

Tom DeLappe, a veteran cabinetmaker of High Point, N. C., is the man to thank for the new technique. He invented the disks to solve a common furniture-factory problem: the high cost of unavoidable hand sanding on ornate shapes.

For production use, DeLappe disks are mounted on belt-driven spindles under dust-collecting chutes. A shaper, or comparable table arrangement, is the usual thing where support is needed.

In the home shop, the disks can be used on a circular saw or a motor shaft, a drill press, flexible shaft, or even a portable electric drill. Which one you use depends on what's available, and whether or not the piece needs support or guidance.

Flutter sanding calls for nothing more than a pair of the new disks mounted between two washers. A couple of special washers or the ones already on a circular saw will do the job for you without other changes.

Flutter sanding offers the most flexibility. It's used on intricate routings and contours, and on delicate and fragile carvings. Two eight-slot disks are placed

new home-shop technique:

with Slotted Disks

one over the other, facing the same way (they last longer when used in pairs). Then the disks are folded to form a pinwheel. Ideal running speed for 6″ disks is about 3,400 r.p.m.—normal saw speed.

Spool sanding requires only the addition of a felt supporting spool. This is simply a buffing wheel of hard felt, with a thickness, diameter and bore size to match the disks and the work.

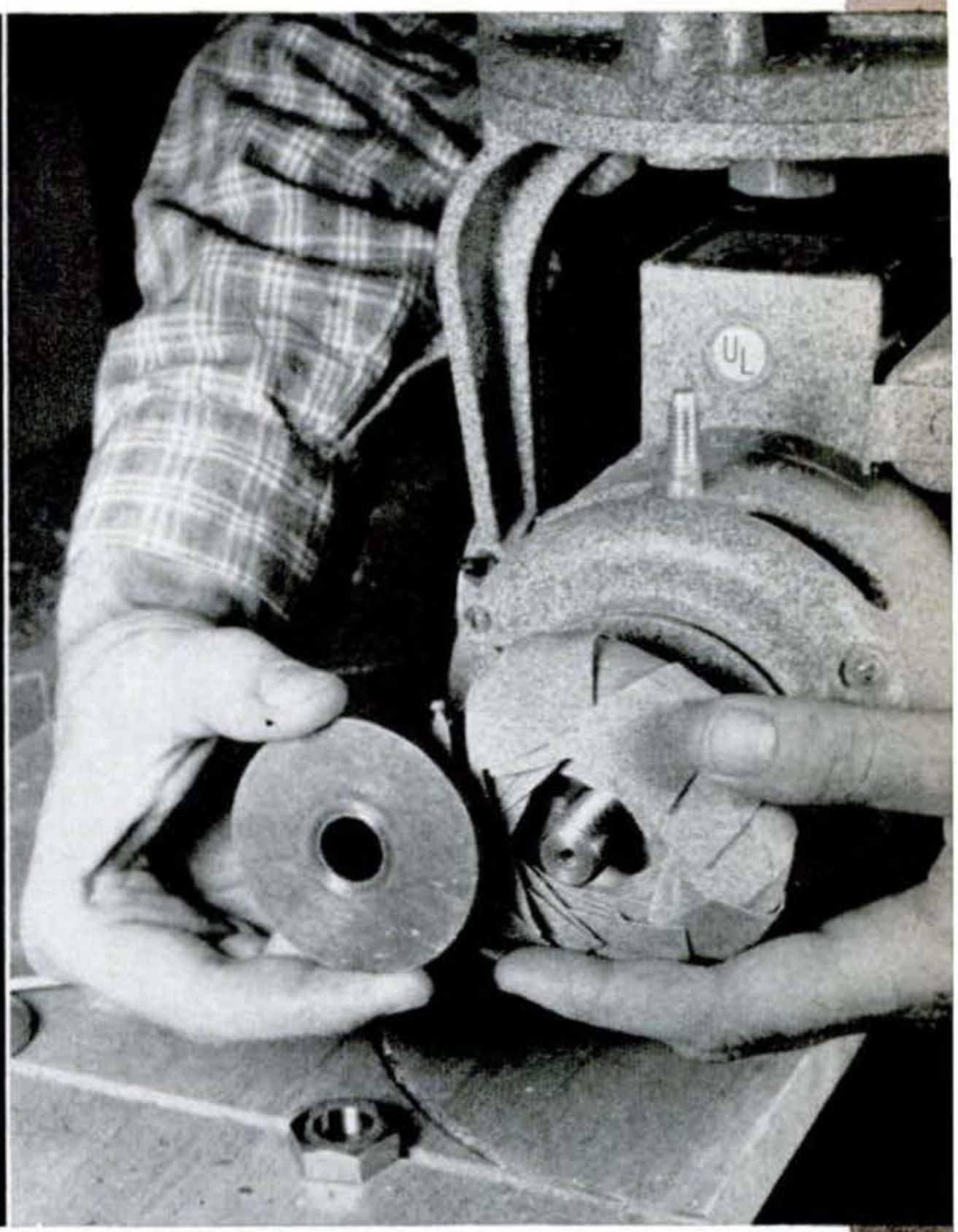
Like the furniture factories, you may find that it pays to keep on hand a variety of these wheels in different shapes and sizes. Frequently, odd lots of surplus felt wheels appear on the market at bargain prices.

The spool-sanding setup gives the slotted disks greater firmness. It's less flexible, of course, for following involved forms, but it cuts faster. And you can do a certain amount of shaping and carving with it.

The approximate 1,750 r.p.m. typical of portable drills and workshop motors

How to use the new radially slotted disks

FLUTTER SANDING takes a pair of eight-wing disks clamped between washers. Corners are folded in same fashion as a child's pinwheel.



SPOOL SANDING takes 16-wing disks, folded over a felt buffing wheel. Spool sander cuts fast, can be used for shallow carving and shaping.

CONTINUED

is a good one as well for spool sanding.

Although factory-made disks work best and last longer, you can try out this sanding method with an ordinary sanding disk. Cut eight slots in it and fit it to your arbor with washers.

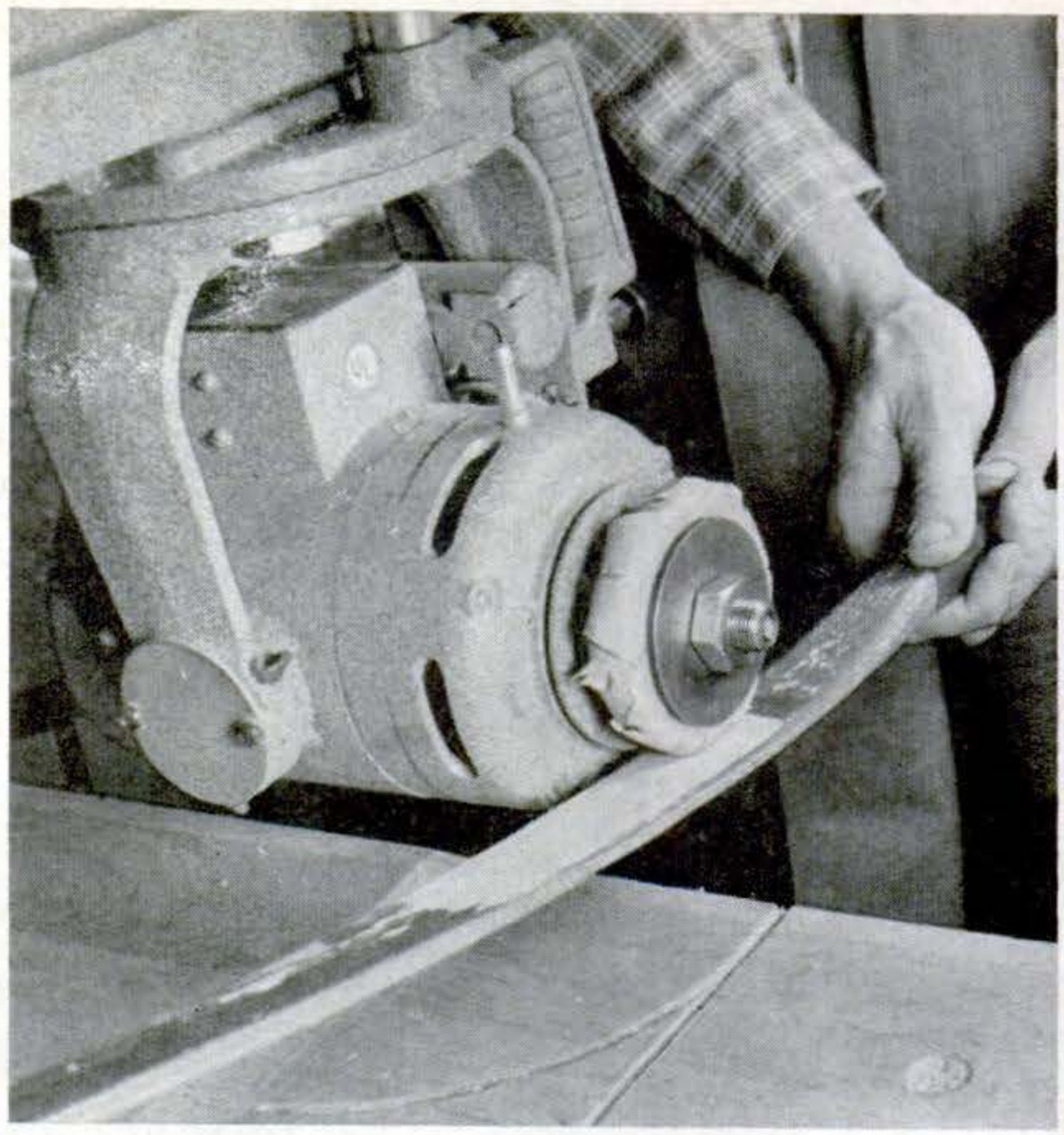
The commercial disks aren't on sale yet at all retail outlets, but you can obtain them from the Kambro Paint and Hardware Corp., 1185 Avenue of the Americas, NYC. Kambro has arranged to handle inquiries and mail orders for the manufacturers of the disks, the Behr-Manning Division of the Norton Company.

Six-inch disks are the most generally useful ones in the home shop. For flutter sanding, these should be eight-wing; for spool sanding, 16-wing. The backing recommended by Behr-Manning is called "double-flexed J-weight cloth."

The disks are priced upwards from about 15 cents, depending on size and grit.

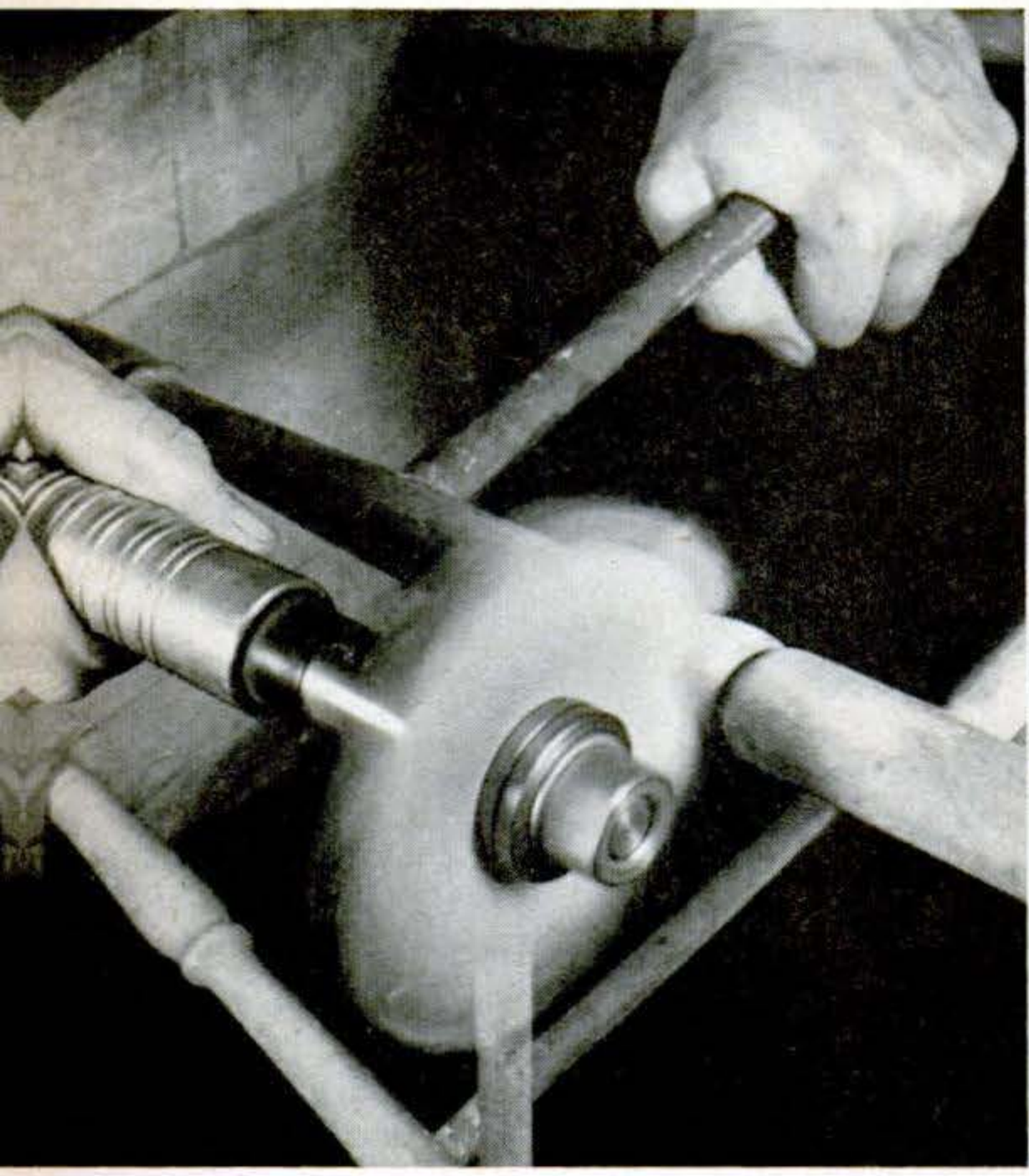
A good all-around abrasive choice is open-coat garnet in 2/0 grit. If you make considerable use of the new techniques, you'll probably want to add other grits, perhaps 1/0 and 3/0.

Removing paint is a breeze

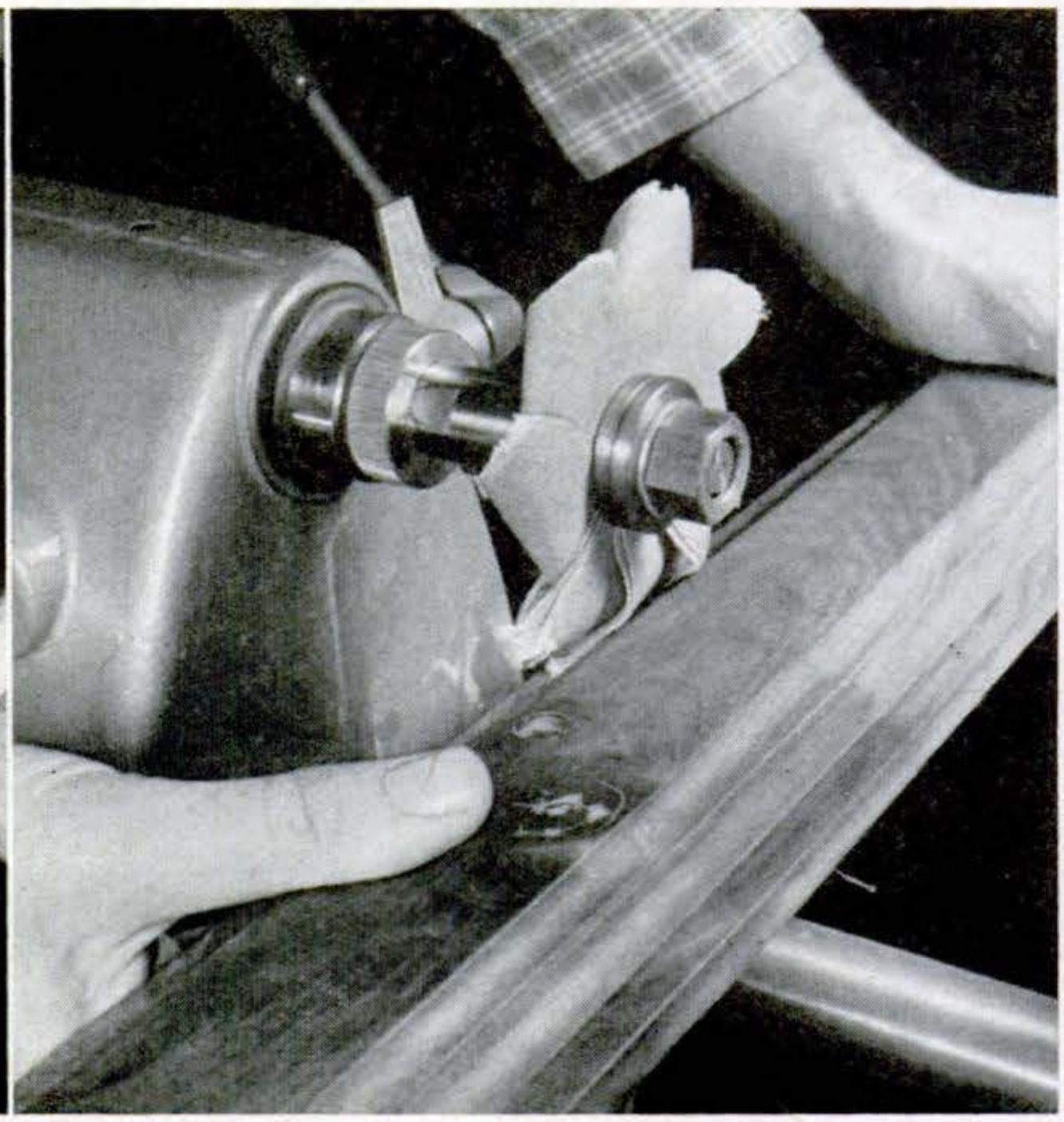


SPOOL TECHNIQUE removes paint without changing shape of work. Here it's used on a relatively flat surface otherwise needing hand sanding.

Flutter sanding's deft touch saves work



REMOVING PAINT FROM TURNINGS, a headache when refinishing furniture, is an easy job for flutter sander mounted in flexible shaft or drill.



WORN DISKS used in flutter sanding can be rejuvenated by trimming them to a smaller circle. Sharp corners are needed for really fine work.

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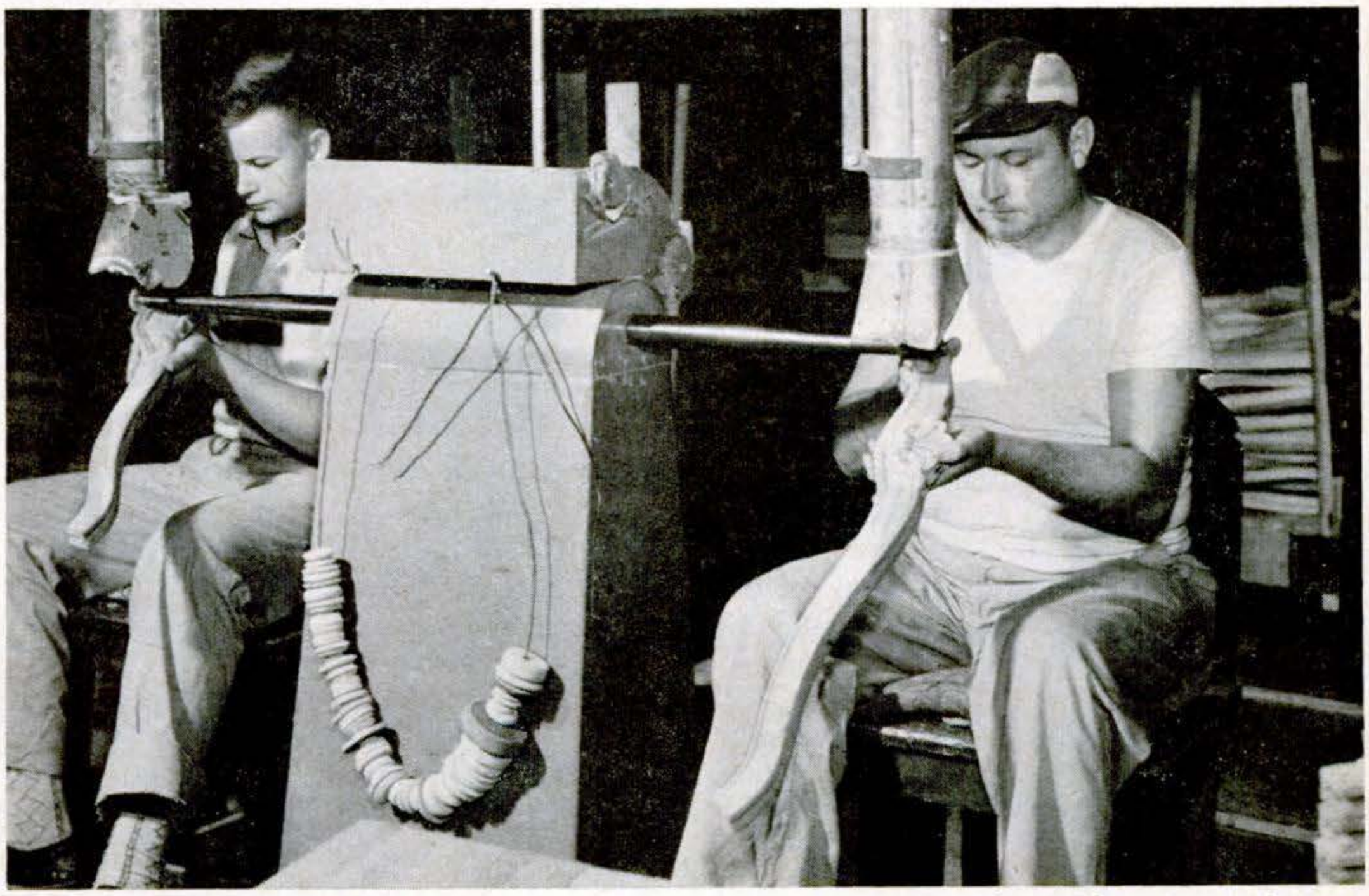
with slotted disks and spool sanding

SHAPER TABLE is used commercially to support work while flute is sanded. Home-shop equivalent is an arbor mounted in a drill press.

BELT-DRIVEN SPINDLE, shown here power sanding delicate flutes, can be duplicated in a home shop by mounting arbor on a motor shaft.

New technique speeds furniture making



DUAL-SPINDLE ARRANGEMENT in furniture plant speeds production work, can be duplicated in home shop by using both shafts of an electric motor. Hanging on the machine is a wide variety of felt sanding spools to fit differing needs of work and many sizes of slotted disks.

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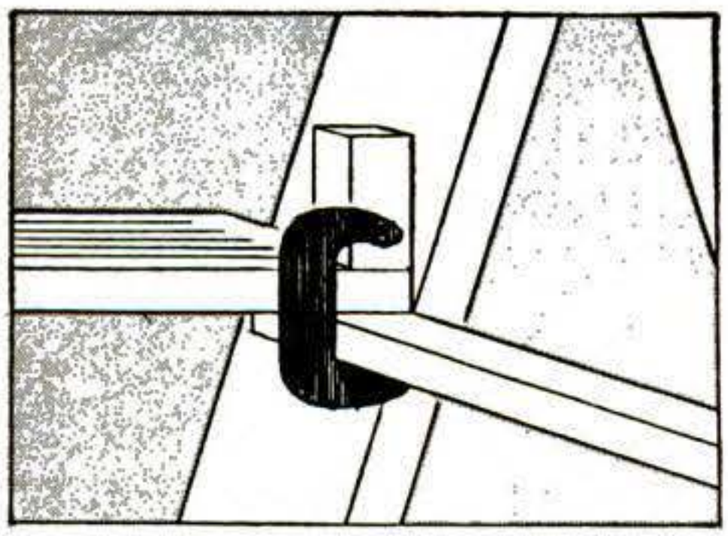
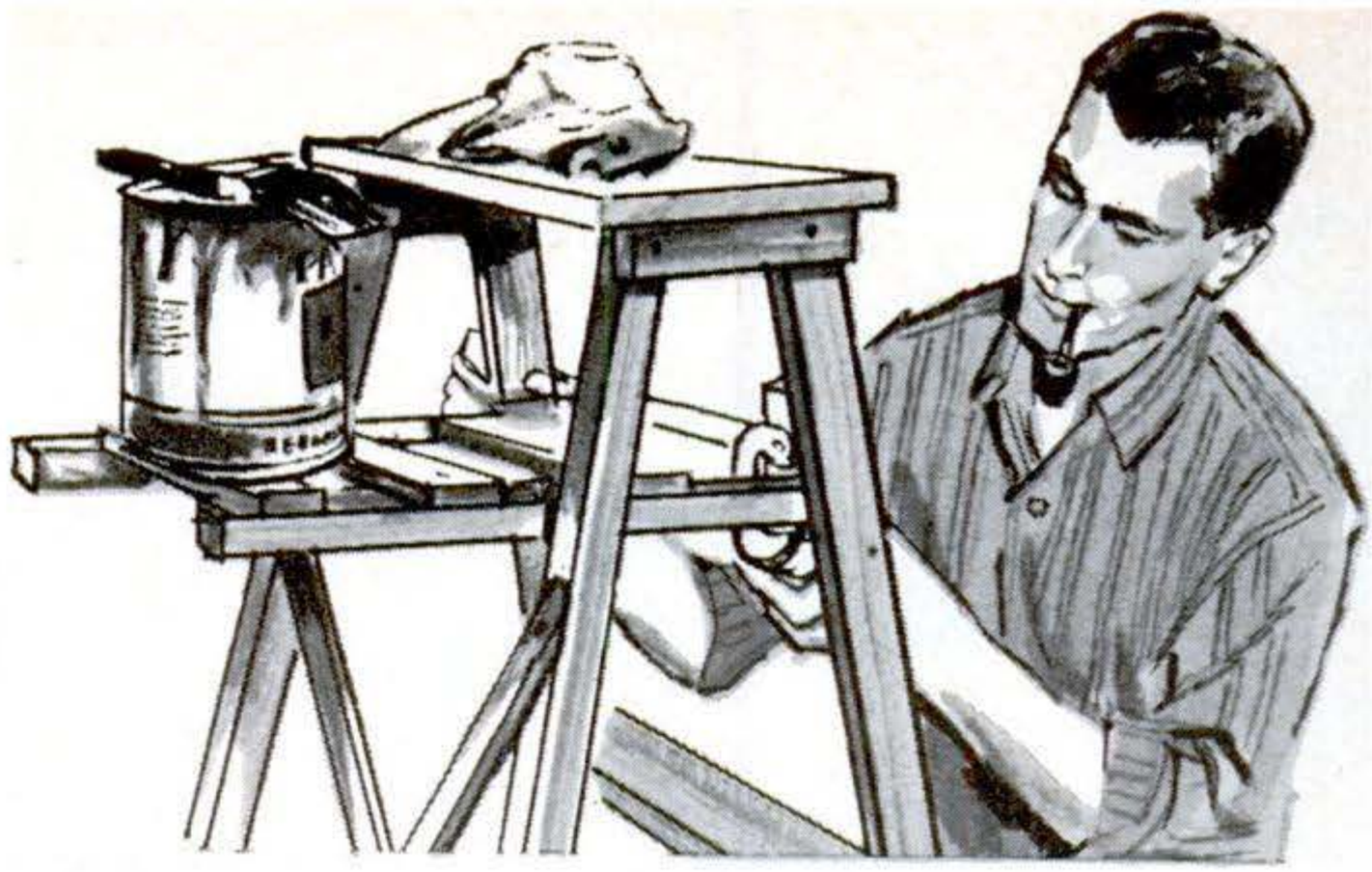
Short Cuts and Tips

FROM PS READERS

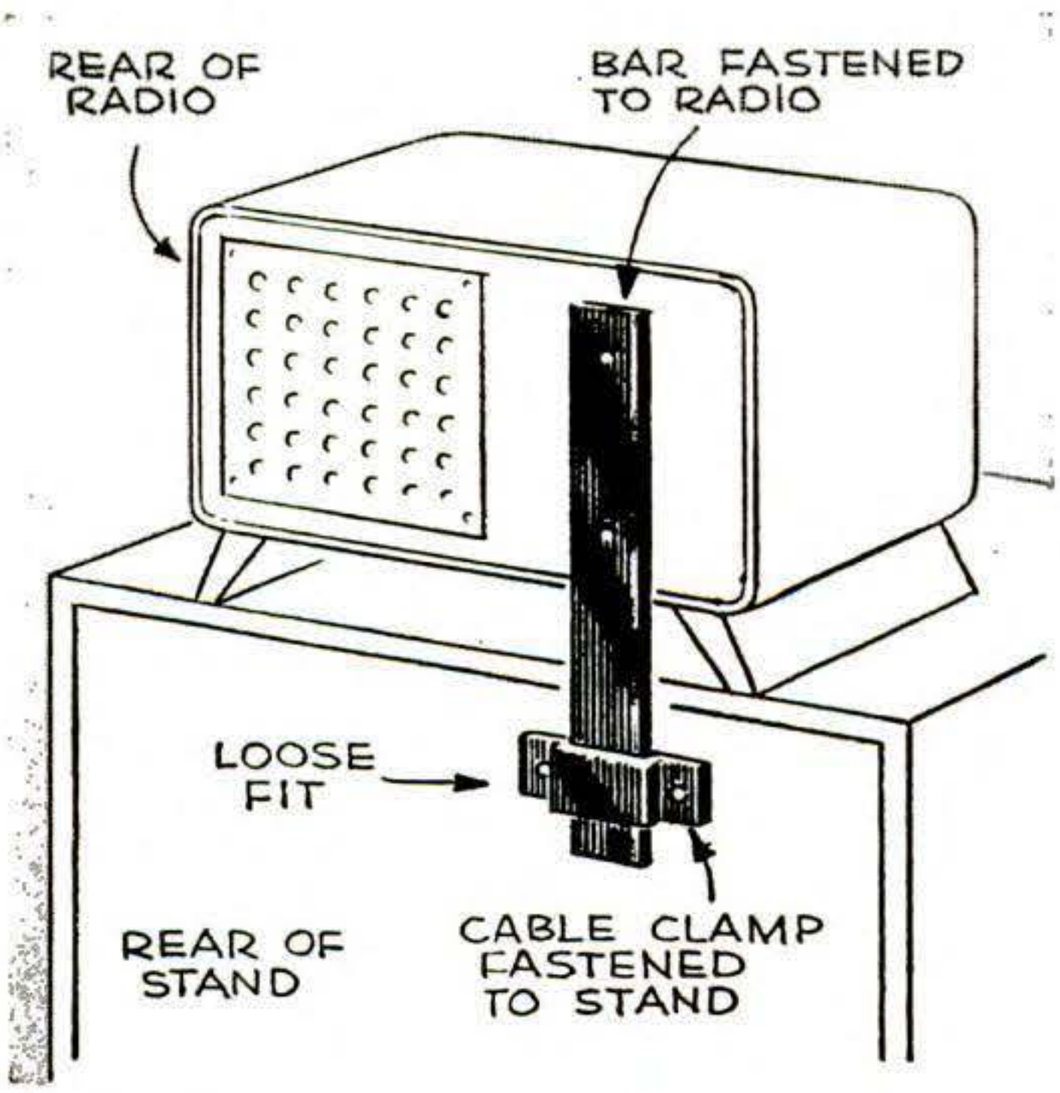




Safety Hook on Ladder Shelf to Prevent Accidental Spilling

WHEN I inadvertently tipped the shelf of a stepladder that held a can of paint, I found out—the hard way—how much surface a quart would cover.

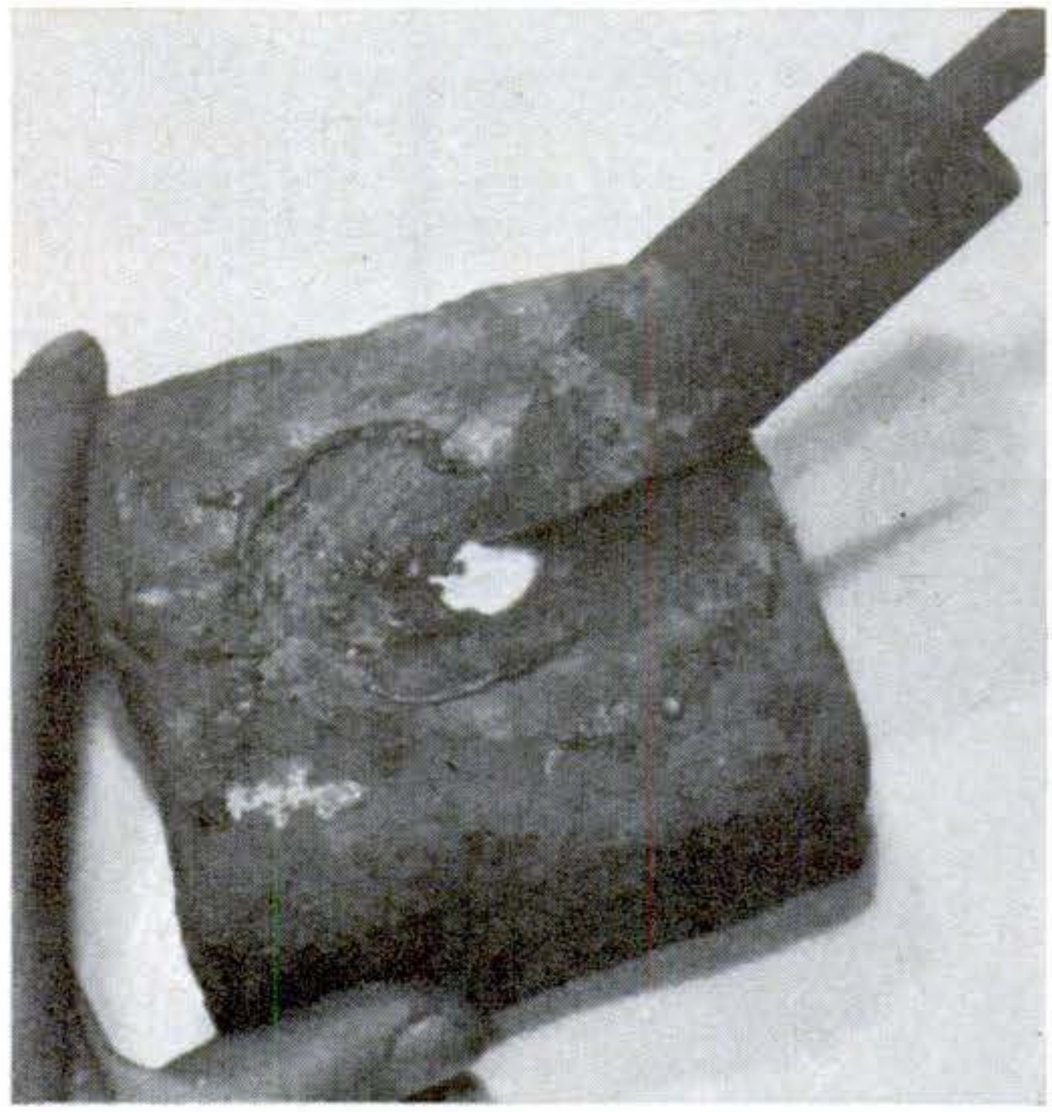
To avoid a repetition of the disaster, I made a lock for the shelf. I nailed a tapered block to one of the step rails and on its vertical side installed a C hook cut from 18-gauge sheet steel. The hook is put on with one nail so it can be swung under to hold the shelf extension.—*Gale L. Ferguson, Bradenton, Fla.*



Crashproofing a Radio

A CLOCK radio can be protected from accidental tumbles by this holster arrangement. It cannot be pushed off the stand, but can be easily lifted off for dusting.—*Richard Lefever, York, Pa.*

▶▶▶THAT fancy Christmas-gift decanter will make an unusual decorative piece, especially pretty in sunshine. Simply fill the decanter with water, and add a few drops of vegetable coloring. The color can be changed frequently.—*Maurice T. Ehinger, Fort Wayne, Ind.*



Plating a Soldering Iron

ONE of the best means of keeping a soldering iron brightly plated is to use a common brick. A slight cavity is chiseled into the brick, and the depression kept filled with drops of solder. A thimbleful of powdered resin may then be melted with the solder and the hot iron worked back and forth to tin it. This is a trick I saw used 30 years ago by an old-time tinner whose soldering copper was an extension of his right arm. He transferred solder from the brick to his work.—*Raymond Winburn, Lee's Summit, Mo.*

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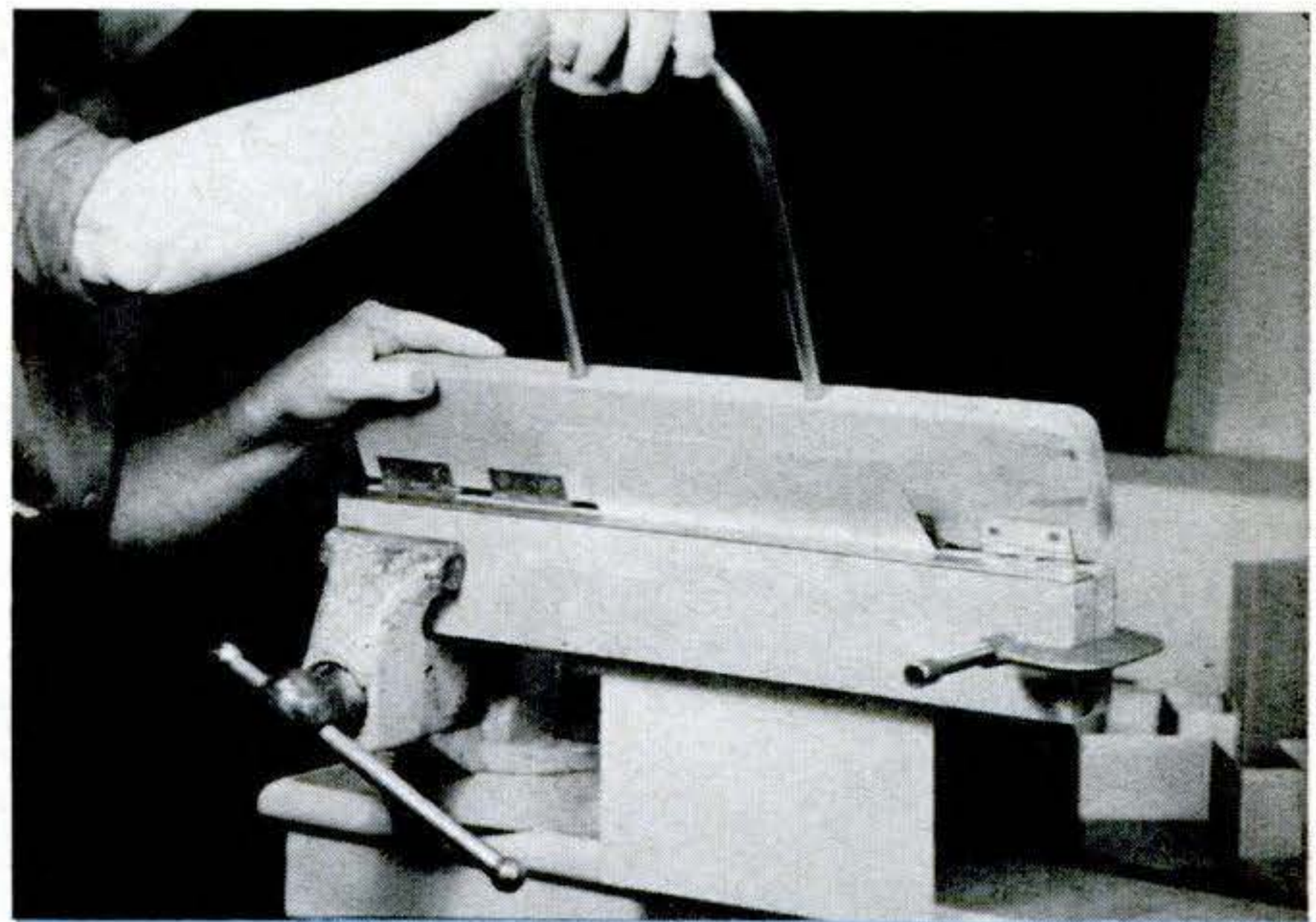
The rewards are great and it's easy to build—

A Simple Sheet-Metal Brake

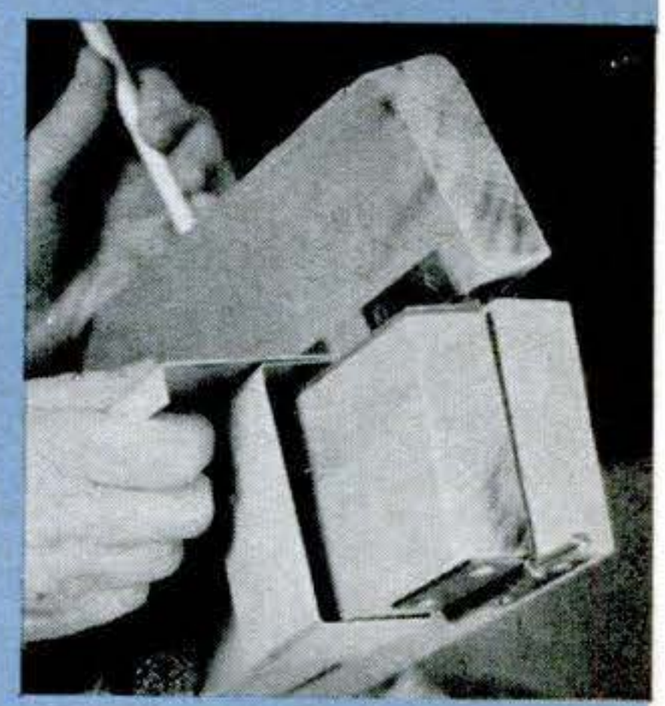
HERE'S a homemade sheet-metal brake that will repay you many times for the hour it takes to build it. It forms accurate bends as long as 18 inches in half-hard steel up to 26 gauge, and in soft aluminum and copper up to 20 gauge.

Start by cutting the jaws and bending bar from close-grained hardwood. Attach a ⅛"-by-1"-by-18" length of strap steel to what will be the bending edge of the bending bar, using countersunk screws. Then countersink the holes in three pairs of 1"-by-3" full-surface hinges on the reverse sides of the leaves and apply the hinges to the bending bar and upper jaw as shown in the drawing. Connect the upper and lower jaws with a pair of 1"-by-3" loose-pin, full-mortise hinges placed at the extreme ends of the assembly. Finally, point the ends of a 28" length of ⅜" solid curtain or drill rod with a file, bend the rod to form a U-shaped handle and force-fit it into undersize holes in the bending bar.

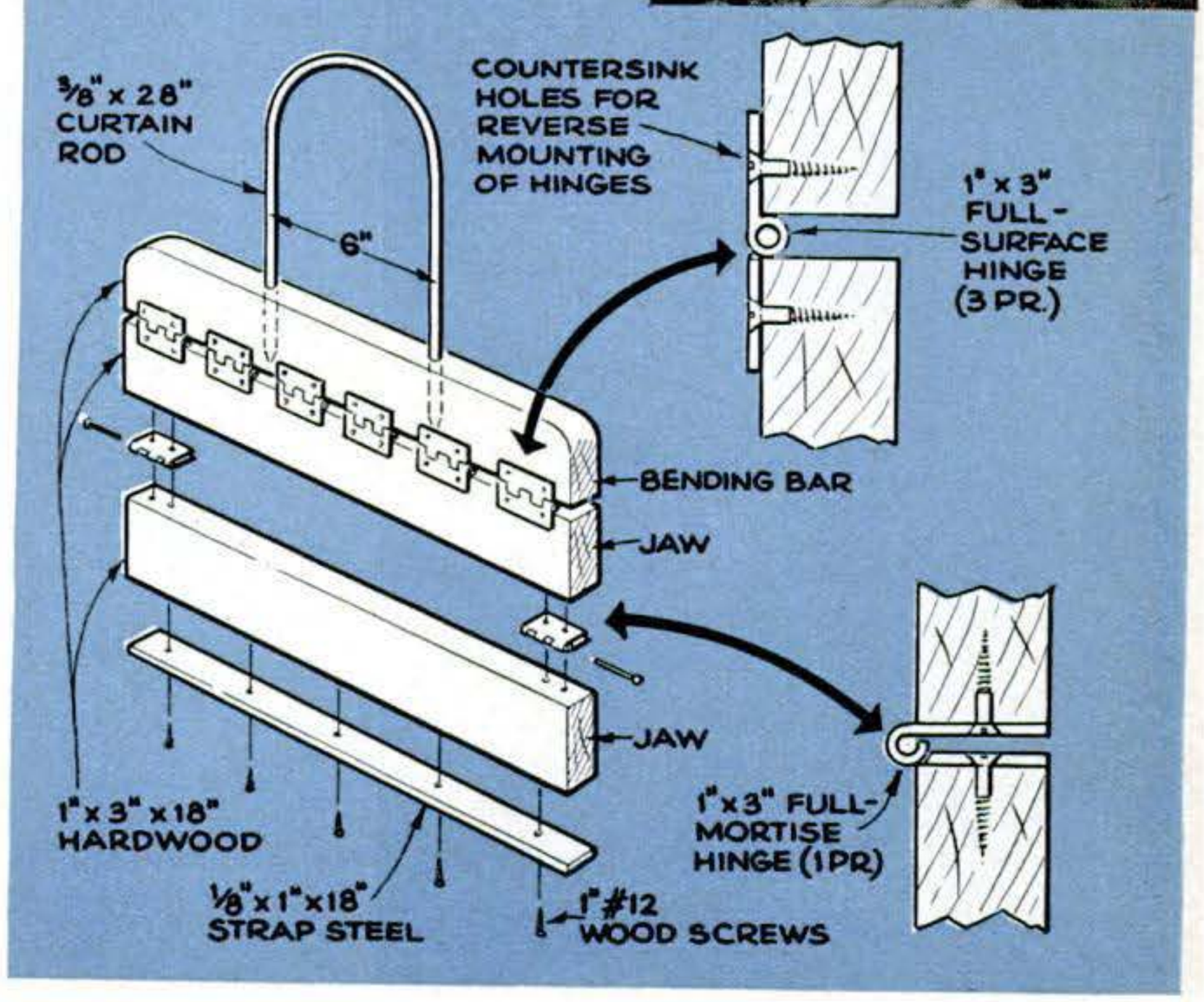
To use the brake, grip the metal to be formed between the closed jaws, with the bend line flush with the top of the strap steel. Put a squeeze on the jaws with a bench vise at one end and a C-clamp at the other. Then lever the bending bar forward against the metal with the handle.—*T. E. Halldorson, Evanston, Ill.*



FLIP HANDLE FORWARD and brake makes straight bend with inside angle of up to 90 deg. Don't let screw-heads project above hinges or they'll dimple the work.



LOOSE-PIN HINGES let you shape channels and rectangular forms. Remove the pins after each fold and slip the work over lower jaw. Then replace the pins.



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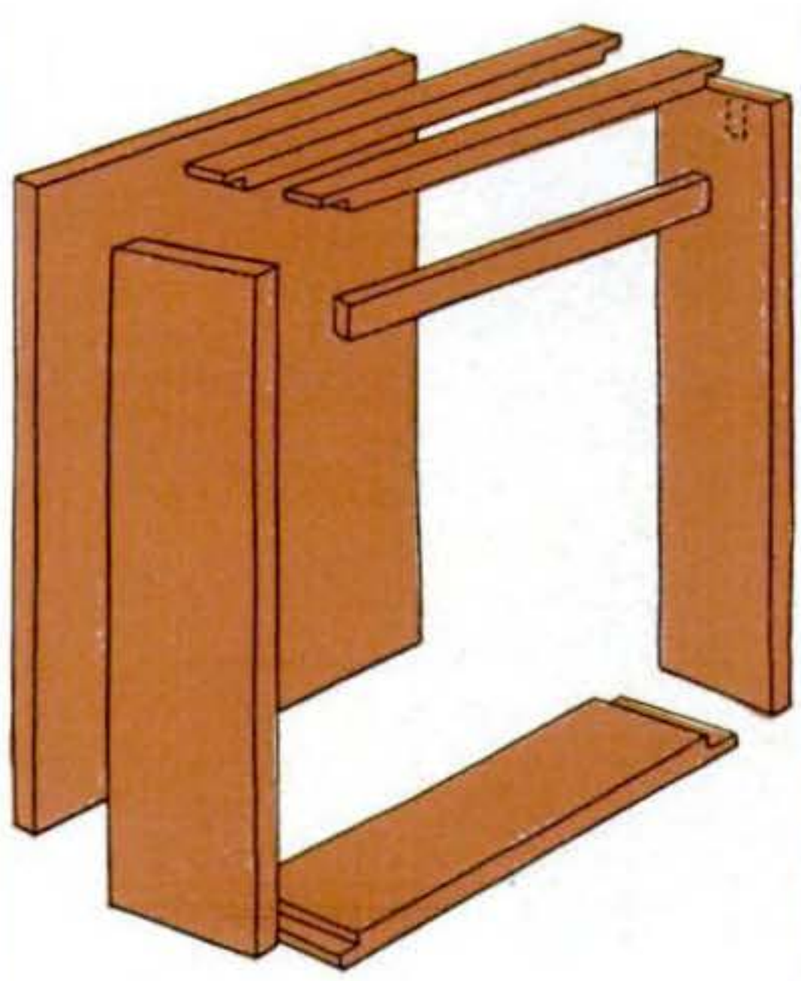
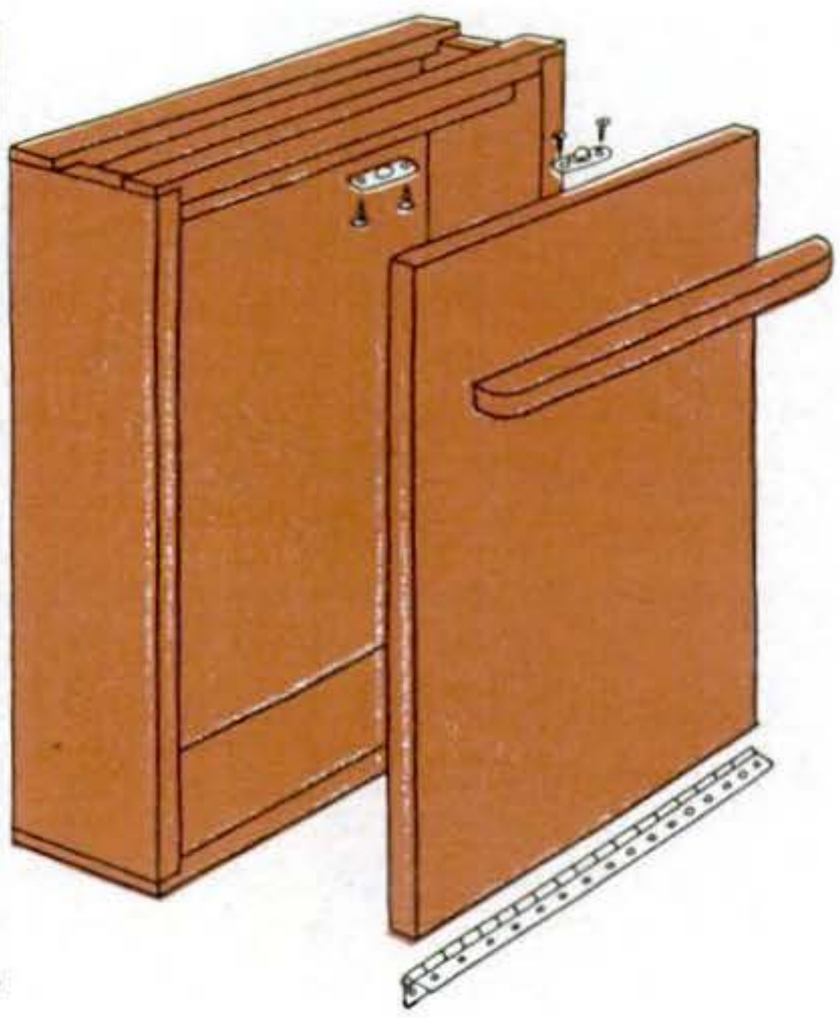
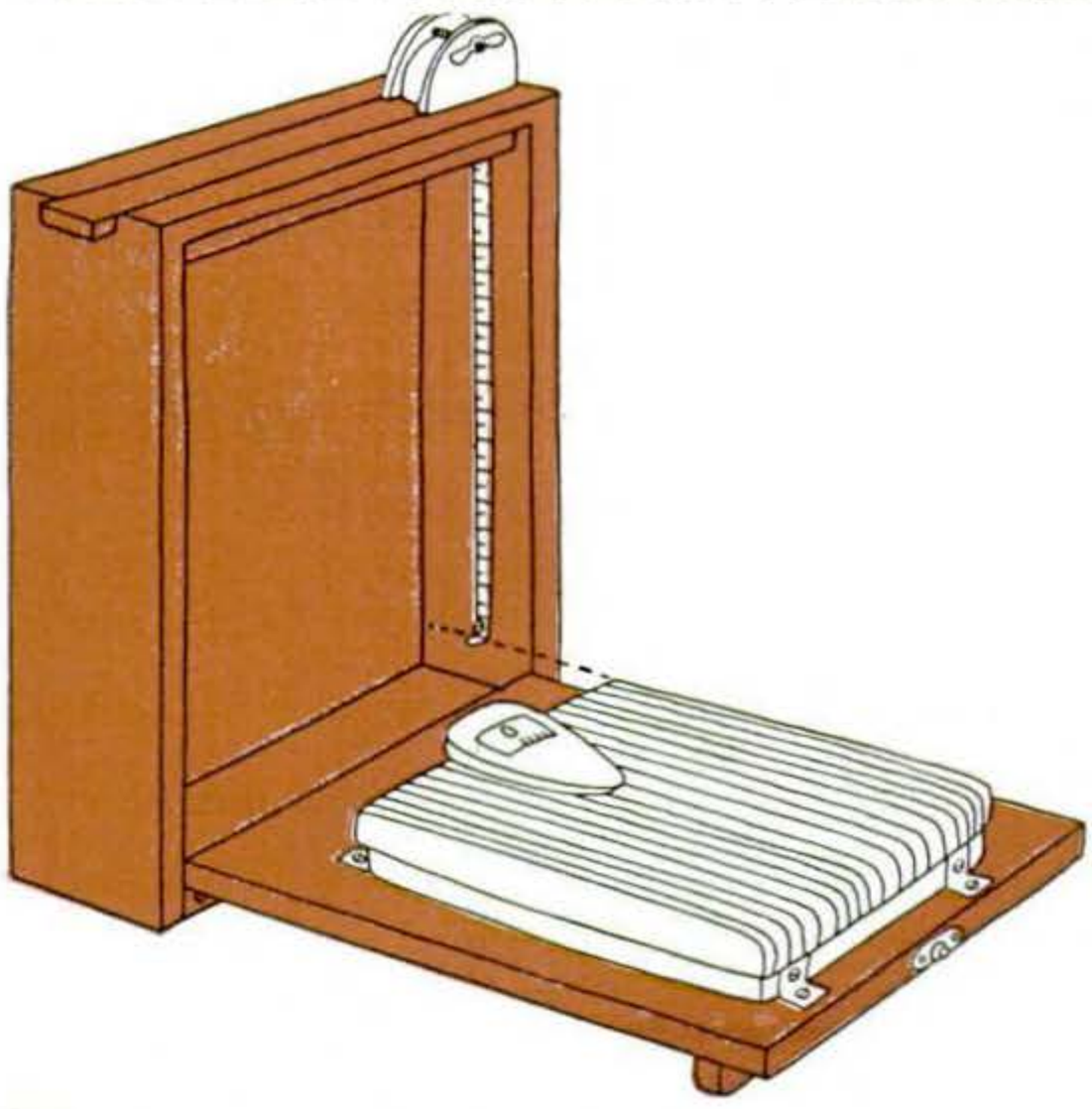
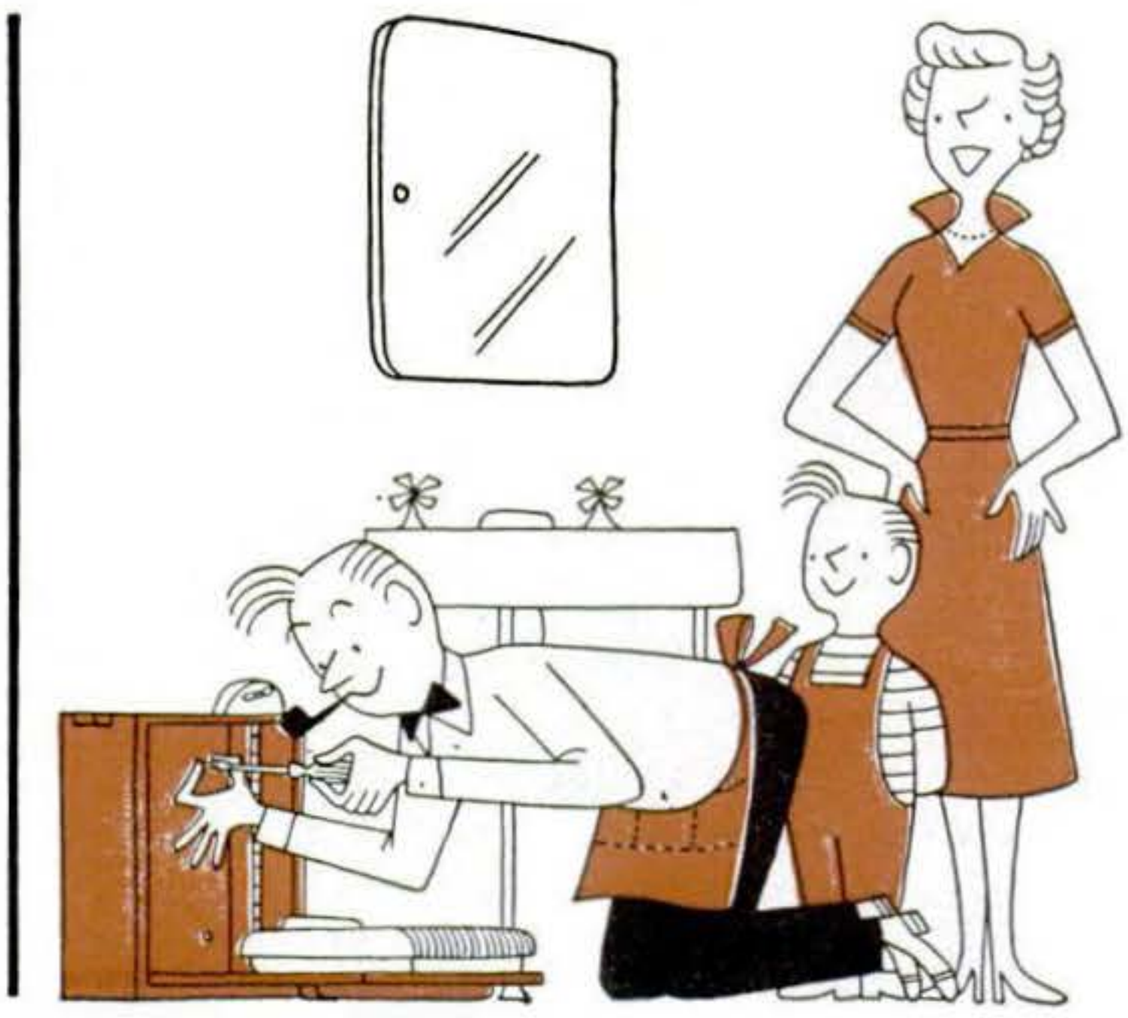
Wordless Workshop

By Roy Doty
and Herbert R. Pfister









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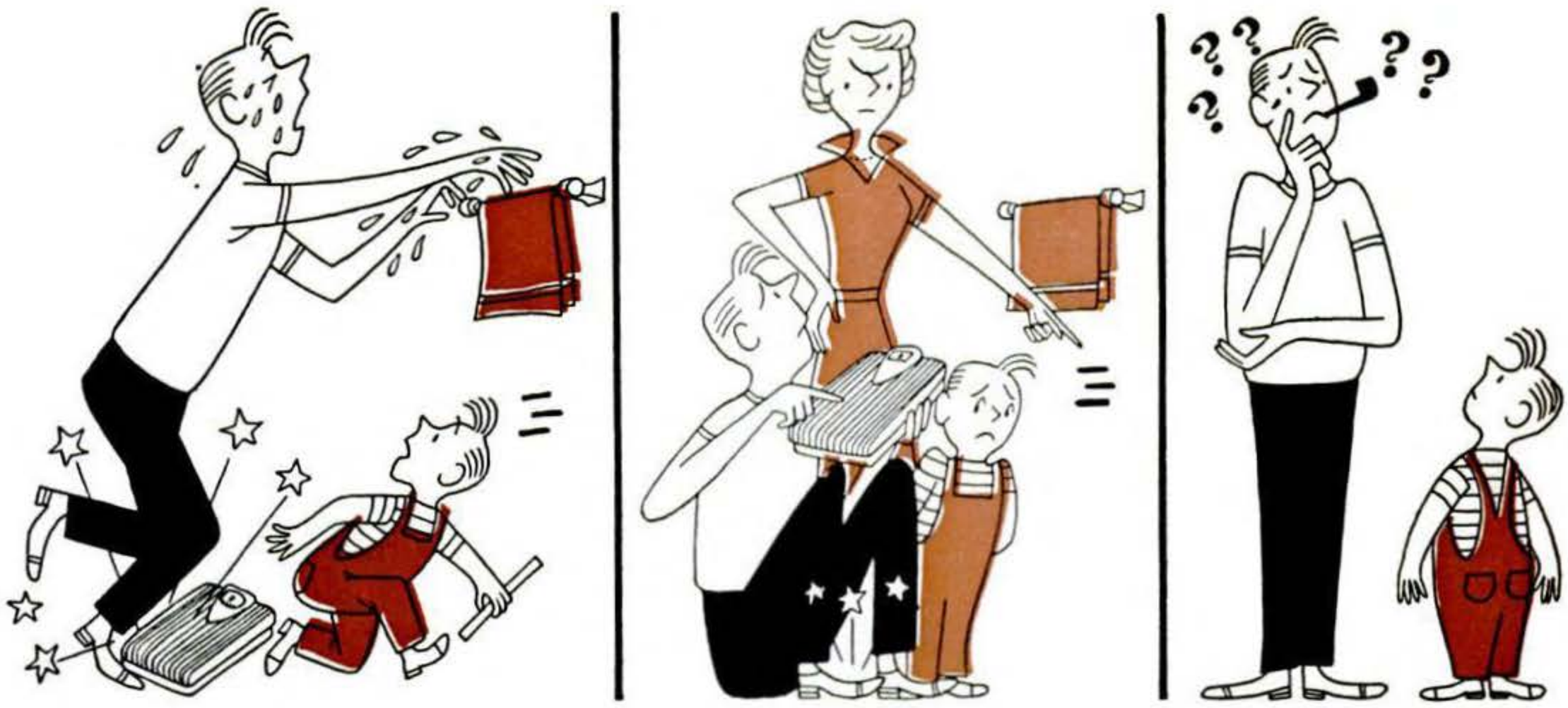

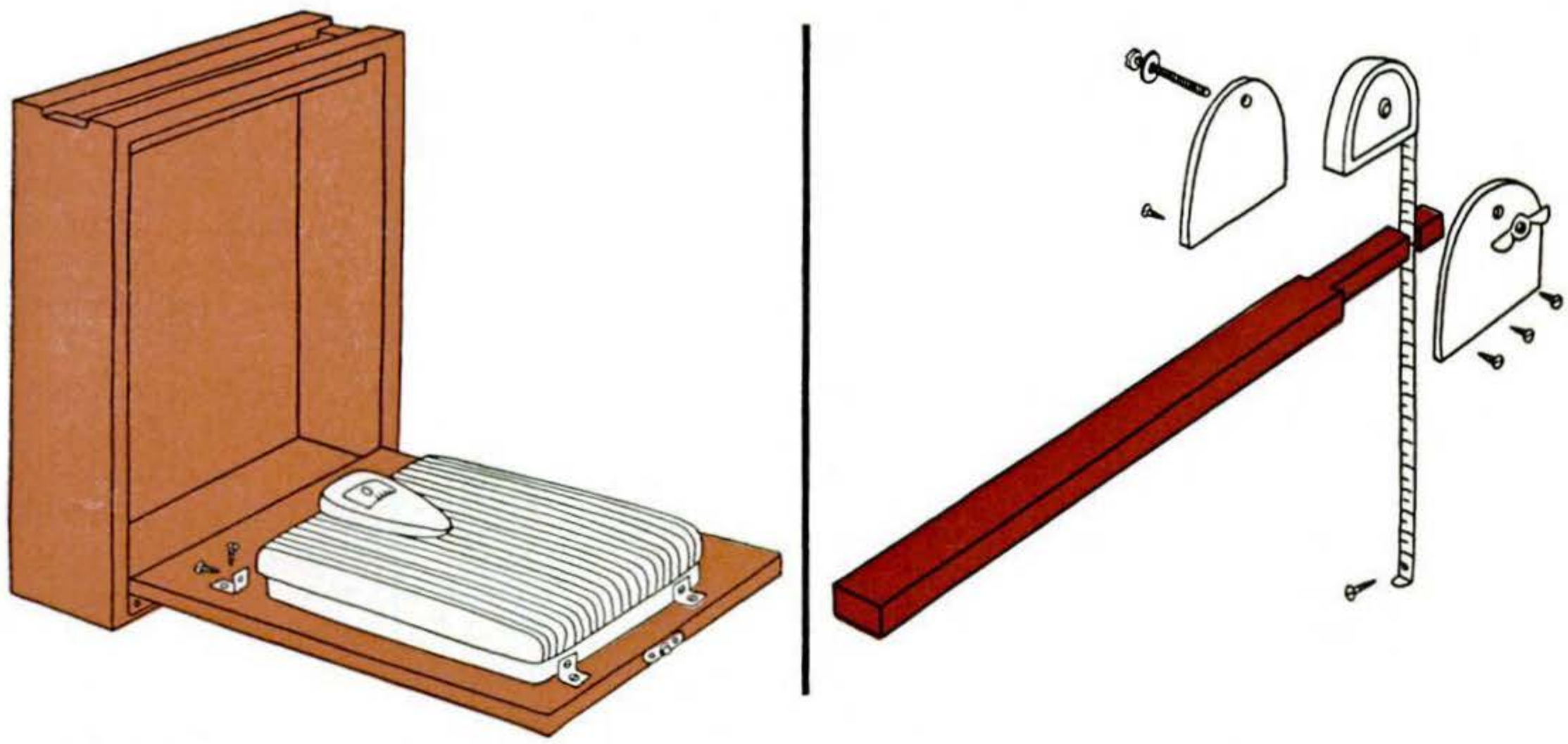

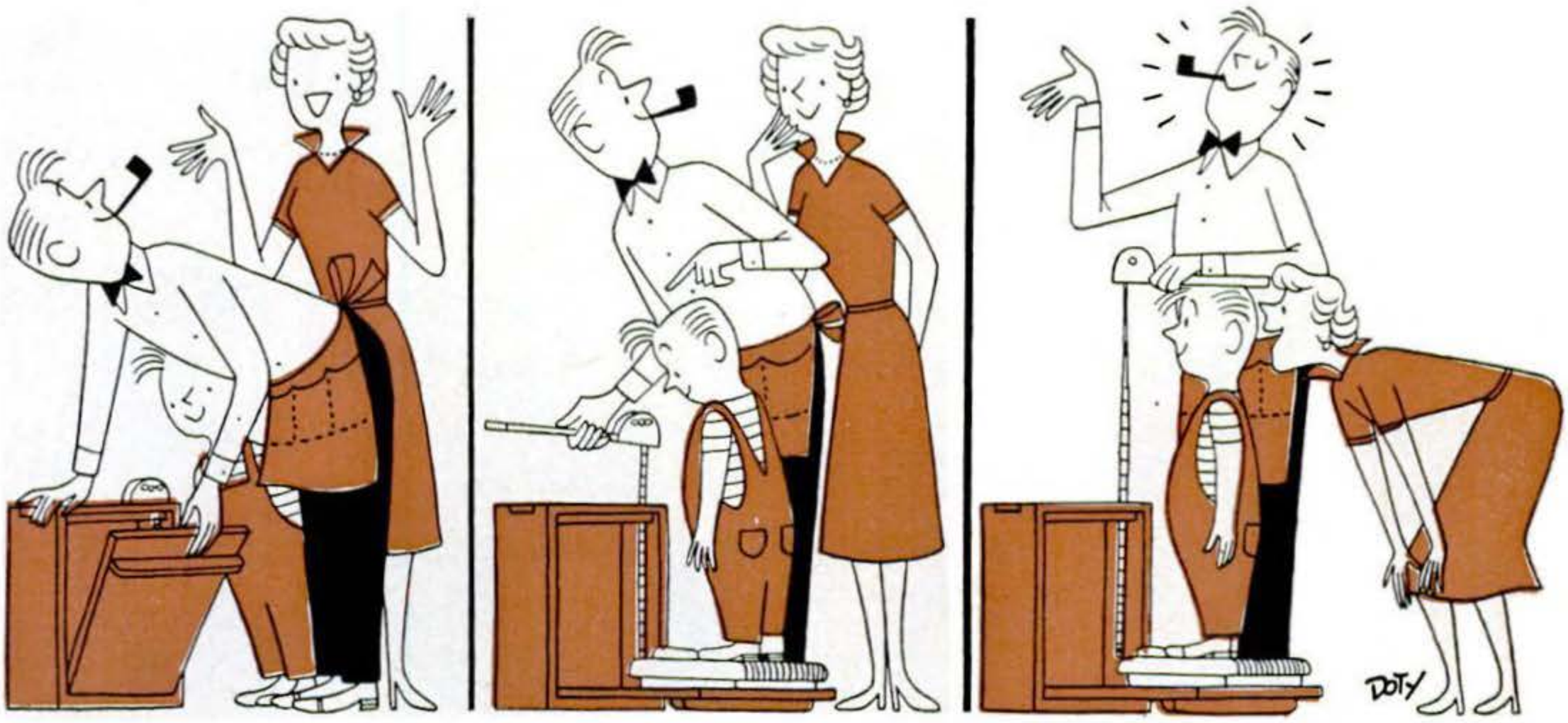

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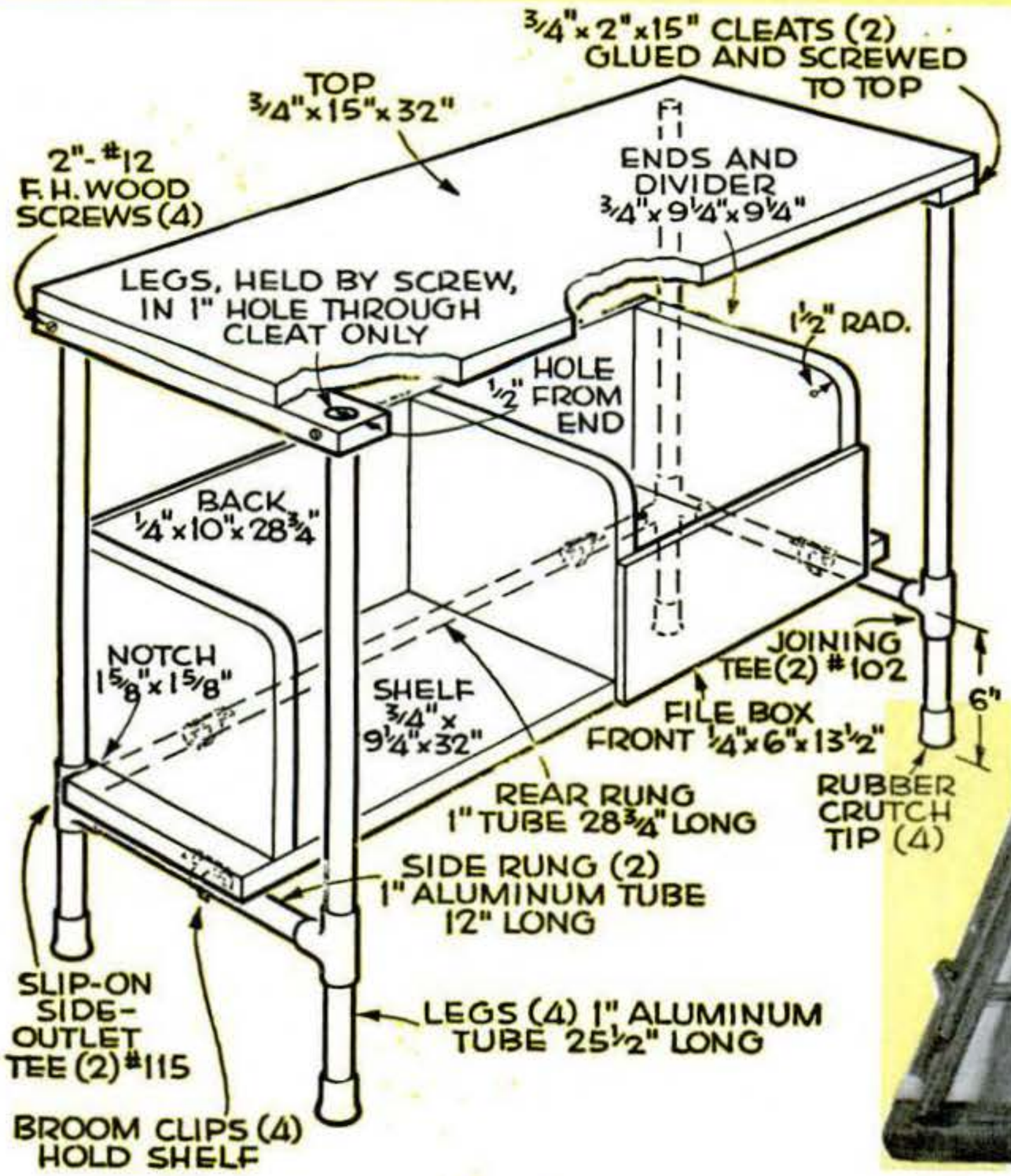
The Typing Table That Went to College

THIS typing table, born of necessity, has proved very popular in the rooming house where it has been used at the University of California's Riverside branch. Knocked down, it needs little space to travel along with its typewriter and student. It takes up only three cubic feet—and much of this can be filled by papers and books that have to go along anyhow.

Only a screwdriver and an Allen wrench are needed to assemble the table. The screwdriver is used to insert the screws pinning the legs in their sockets. The Allen wrench is needed to tighten the setscrews holding the rear rung. The shelf is secured by broom holders.

The desk can be made of either 1″ lumber or ¾″ plywood. One-inch outside-diameter aluminum tubing is used for the frame, assembled with slip-on fittings.

The fittings come from the John H. Hosking Co., 1704 Howland Ave., Cincinnati. The four used cost about $4.25. —*Paul Corey, Sonoma, Cal.*



KNOCKED DOWN FOR TRAVEL, the legs and rungs of the desk fit into the top. The shelf, still loaded with books and papers, rides above, part of a three-cubic-foot package.

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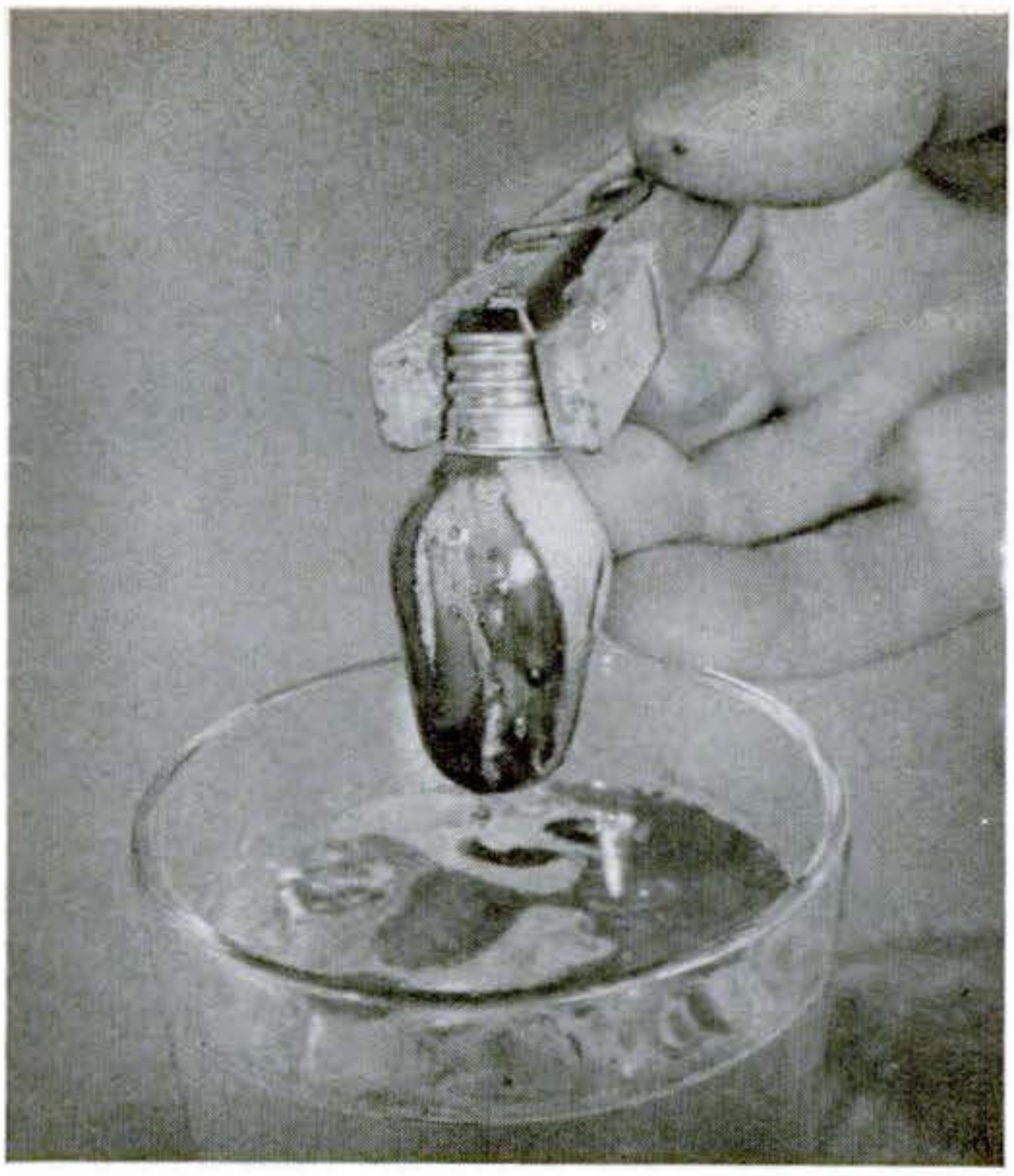
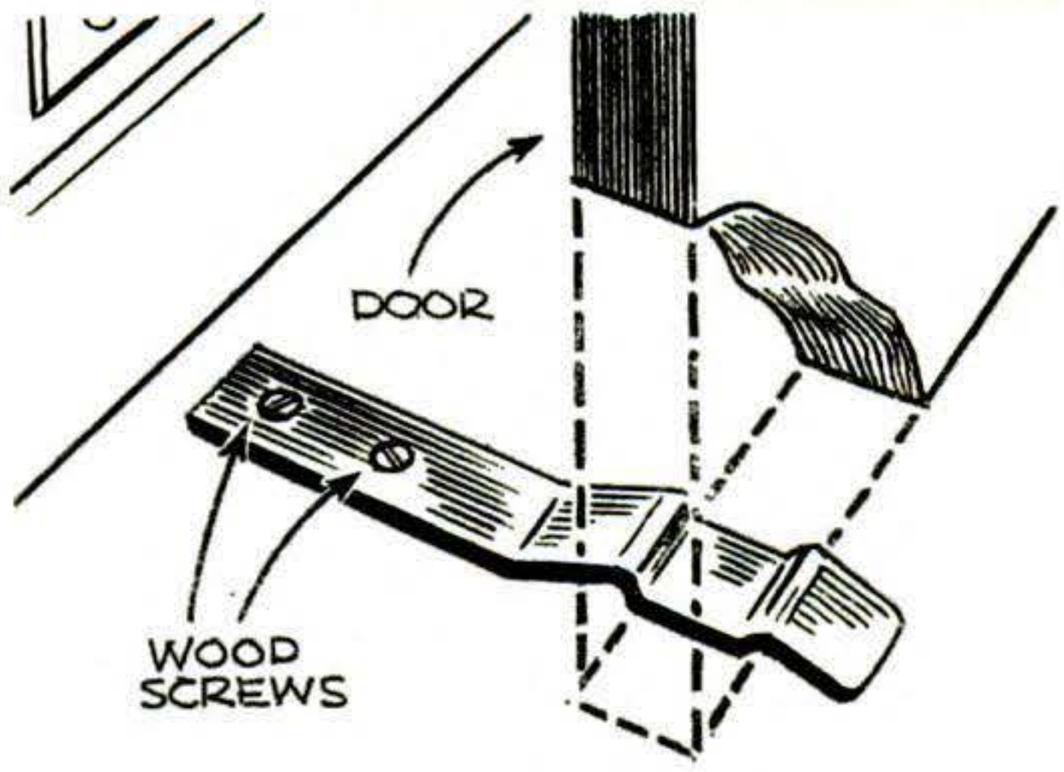
Short Cuts and Tips

FROM PS READERS



Marbleizing Yule-Tree Lamps

FOR pleasingly different ornamental bulbs, fill a glass nearly to the top with water and add droplets of oil colors well-thinned with turps. As these float on the surface, stir them lightly with a toothpick until they form attractive marble designs. Dip uncolored 7½-watt lamps in the bath. Set them aside to dry in an upended paper box cut with holes or hang them on strings.—*J. L. Monroe, Akron.*

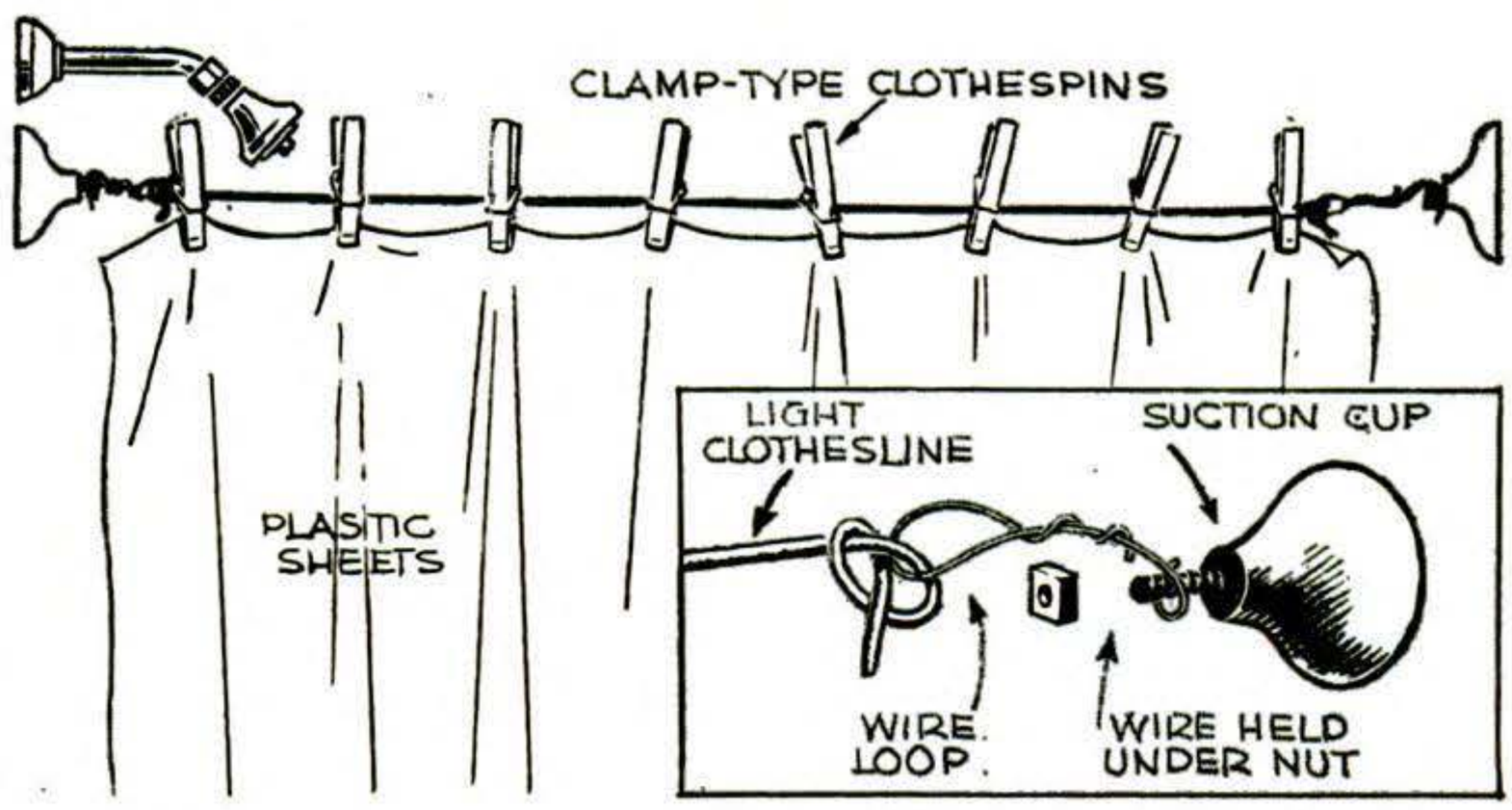


Windproofing Doors That Slam

INSIDE doors have an unhappy tendency to slam shut with a sudden breeze. This door holder solves the problem without causing you any extra effort to open or close the door. To release the catch, simply press its exposed end with the toe. Any light spring metal may be used to make the holder; the original was made of ½" tempered brass about 1/16" thick.—*R. W. Bostrom, Minneapolis, Minn.*

Pinning Up a Shower Curtain

HERE'S an easy way to hang a temporary shower curtain at home or when you're away at a vacation cottage. My husband strung light clothesline between suction cups stuck to the walls. Then we hung a large sheet of plastic from clothespins.—*Mrs. William Koski, Racine, Wis.*



▶▶▶CHRISTMAS-tree ornaments can be made shatterproof with shellac. Pour a little inside the ornament, swirl it around, and pour out the excess. When it's dry, replace the hanger clips. The film of hardened shellac will hold broken pieces together if the ornament is dropped.—*Edward Bentley, Jackson, Mich.*

▶▶▶I WANTED to line my playroom walls with padded seats until I priced regular upholstery and turned green. Then I hit on the idea of using old auto seats, bought at junk yards for about 75 cents apiece. I built them up on a hollow base so I even have storage space underneath. —*Clark A. Berkhoudt, Buffalo.*

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Anything can happen when a TV repairman starts—

Patching High-Voltage Leaks in TV Sets

By Art Margolis

High water pressure in your plumbing lines can spring a leak. Sometimes the high-voltage system in your TV set acts the same way. The cure in both cases is to patch the leak. There is one big difference, however. A water leak is usually easy to locate. Tracing a high-voltage leak takes electronic know-how.

ONE day when my wife was visiting friends in the next town her mother called me up at the shop. "My portable radio isn't working, dear; could you pick it up?"

Fiddling absent-mindedly with the control knobs of a 21-incher I had been working on, I explained that I was busy. Just then the audio came on, a sexy voice, "I'm waiting for you, darling."

"Busy, indeed!" came a snort over the phone, then a click.

I was about to call back when a group of girls trooped into the shop. They were on-the-job trainees from a local TV manufacturing plant on a field trip. The set on the bench was to be part of my demonstration. The symptoms were a hissing noise and streaking in the picture.

Explaining that the hissing was the sound of corona, I elaborated on the cause. "The high-voltage section of this particular set develops about 15,000 volts. The chassis is zero volts. The electrostatic potential between the two is powerful, and the 15 KV strives to go to zero and equalize itself."

The girls nodded. I went on with my lecture. "Corona occurs when the potential gradient between conductors exceeds a certain value but is not enough to cause sparking. Air around the conductors breaks down electrically and is ionized, becoming itself a conductor. This makes the air glow blue."

"Can we watch it?" asked one girl. "Okay," I said. "Gather around while I switch the lights off." In the dark the bluish glow showed up plainly.

With the lights back on, I proceeded with an electrical plumbing job in front of an attentive audience.

The path of the leak was from the cap of the 1B3 high-voltage rectifier tube to the top of the high-voltage cage. I removed the metal spring clip attached to the cap and put in a plastic-covered one. Then I took a sheet of plastic and taped it over the area that had been receiving the bombardment with high-voltage tape. I turned the set on. There was no hissing, and leaking voltage no longer streaked the picture.

To show that the blue corona haze was gone, I again turned out the lights. The girls crowded around me. A couple of them giggled.

That was when the front door opened. And there stood my wife's mother, the portable under her arm, an outraged look on her face.

A Bad TV Yoke Pays Off

DURING vacation last summer I found a leak in a laundry.

Ten couples from our Mr. and Mrs. Club had rented bungalows on a lake. At the end of the first week we had accumulated a small mountain of soiled clothes and linen. Three of us piled it into my station wagon and we drove off to the nearest town.

There was a self-service laundry on the main street. The owner didn't even look up from a game of solitaire as we walked in with our bundles. There were three machines, and we filled them all.

When I had my machine churning, I looked around. There was a 17-inch TV on a shelf. Since we'd be there an hour

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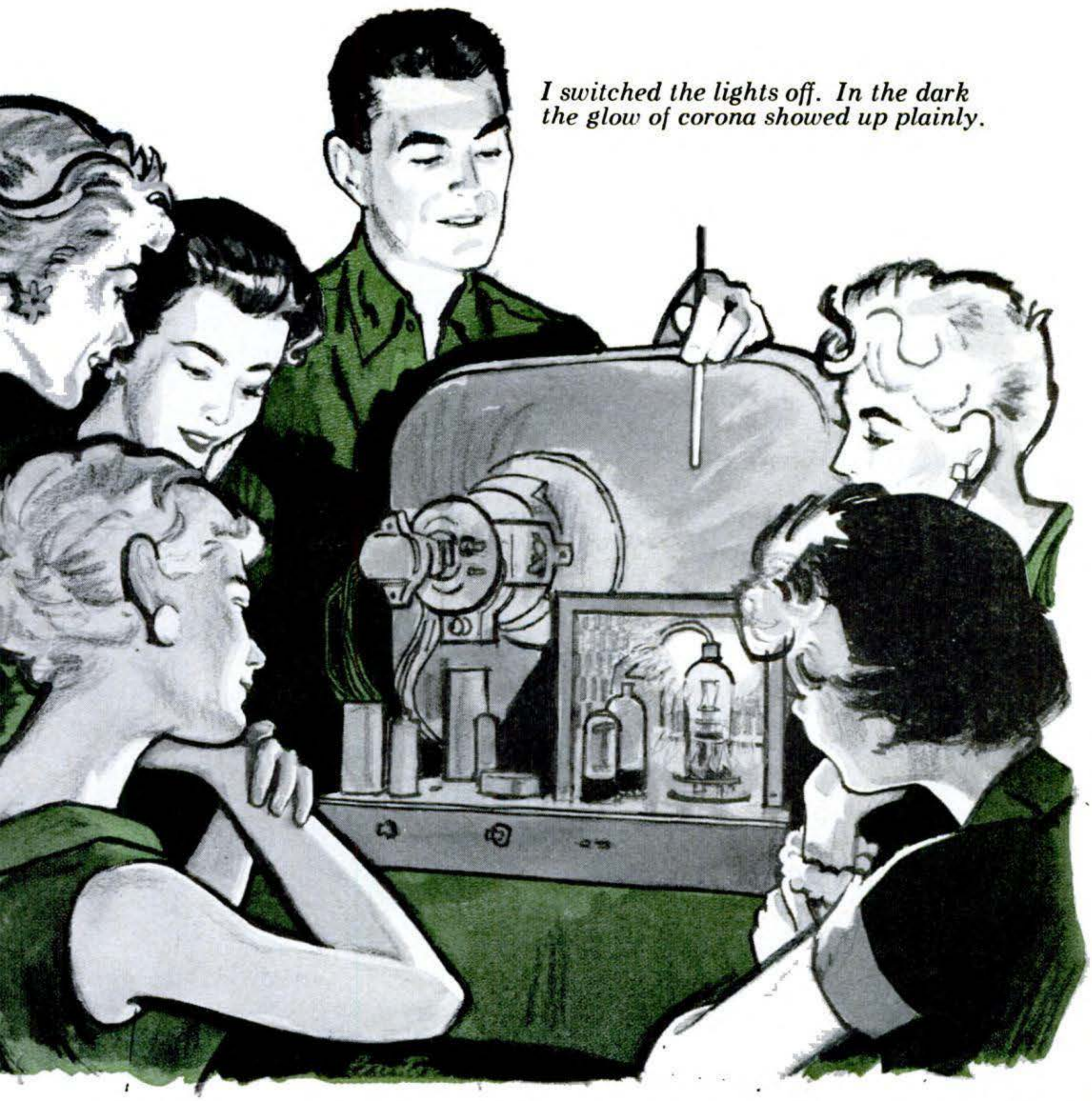

I switched the lights off. In the dark the glow of corona showed up plainly.

or more, I asked the owner to turn it on.

"It don't work," he said, slapping a black eight on a red nine.

"What's wrong?" I asked.

"You wouldn't know if I told you."

"Try me," I countered.

"It's got a bad yoke."

"You a TV repairman?" I asked.

"Nope. Plumber. But I'm taking a correspondence course in TV."

"Tried fixing it?"

"Nope. Got the lesson telling me what's wrong. Ain't got to the one telling me how to fix it."

"Mind if I look at it?"

"Nope."

When I turned it on, a picture came up. It was jumpy and tended to shrink. I looked in the back. There was some sparking and spitting in the yoke.

The yoke around a picture-tube neck has two electromagnets: a horizontal winding that sweeps the picture from side to side; a vertical one sweeping it up and down. They are wound one on top of the other. There is a big voltage difference, since the horizontal winding contains high voltage, the vertical one low. A heavy layer of insulation prevents leakage. Here I suspected voltage was leaking through a hole in the insulation.

I switched the set off. The man looked up from his cards. "Well, sporty, find the trouble?" I nodded. He swept up the deck and laid out another game. "Tell you what, sporty. Fix it and your

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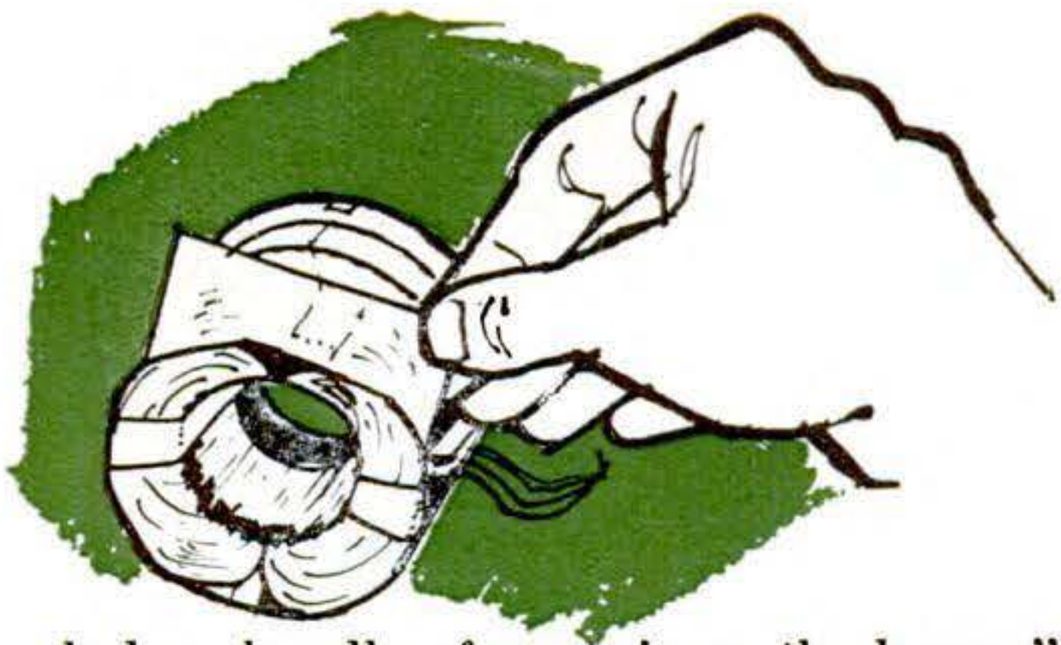

whole caboodle of wash is on the house."

I hesitated. I didn't have my tools, but decided to take a chance. I helped myself to some plumbing wrenches and dismantled the yoke. I found the hole. Then, remembering having seen a hobby shop down the street, I went out and came back with a piece of plastic. I slid it into the yoke, covering the hole.

With the yoke reassembled I turned the set on. I was in luck. The arcing hadn't as yet shorted any of the windings. A beautiful picture came on.

The solitaire player glanced up, then turned to see my buddies walking out, their arms piled high with clean, free laundry. The shock was too much for him. He missed a red jack on a black queen.

From an Author's Notebook

WE HAVE a "haunted" house on the outskirts of town. It had been vacant for years, so I was surprised to get a call from there one evening.

The guy said it was urgent. I don't usually go in for night jobs, but curiosity got the best of me. Before leaving I made an entry "Haunted House TV" in the little notebook I always carry to jot down material for these articles.

The man waiting for me on the sagging porch as I drove up was tall and lean, wearing faded khaki pants and a T-shirt. He led me into a room crammed with massive furniture under dust covers. Tattered shades hung askew over the windows. Cobwebs festooned every corner.

I pulled out my notebook and made some entries. "The TV is over there," he said, pointing to a 17-incher standing incongruously on the top of an ancient handcrank phonograph cabinet. "And the program I want to see is coming up."

"Let's look," I said, examining the set. No picture came on, but there was a loud snapping from the high-voltage cage.

While dismantling the TV, I explained about my spare-time writing. "Might be able to build up a mystery gimmick out of this setting."

"Say, that's an idea," he said. "Make me a criminal and this my hideout and . . ."

"Wait a minute," I broke in. "Being an author isn't that easy. You've got to plot these things out."

He grinned. "You must come over and tell me about it some time. I plan to fix the place up and use it as a—well, sort of hideout."

He excused himself. I found the leak and went to work. There were flashes on the underside of the 1B3 high-voltage rectifier—from one pin to another. This leaking is different than corona, although the cause is the same. In this

case, with the short distance separating the pins, a complete path was ionized between the conductors, making the leak take the form of sparking.

Pointy objects are more likely to spark over than round, smooth ones. Here I had to deal with the pointy pins on the tube socket. I spread the arcing pins away from each other. Then I sprayed some plastic on the underside of the socket. No more voltage leaking.

When I was finished, the man was at my elbow. I hadn't heard him come back. He looked at his watch, leaned over and changed channel. A program was just coming on. It was the first of a new filmed series by a world-famous mystery writer.

"And now," said the voice, "let me present our author."

I looked at the man who stepped into the picture. Then I did a double-take—and gulped. The man on the TV screen and the man at my side were the same.

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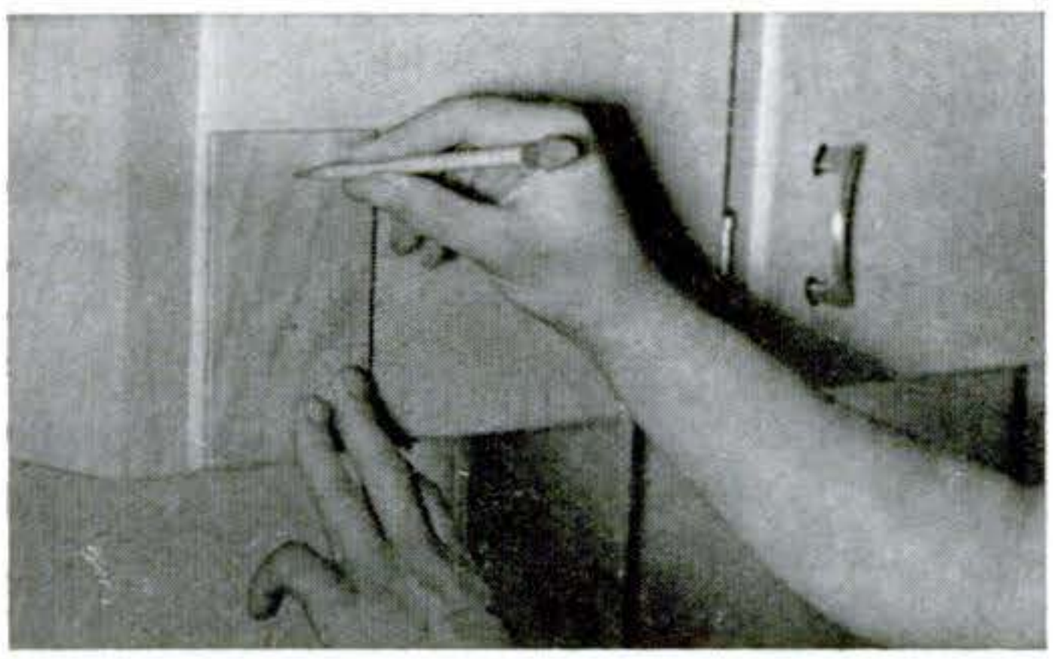
Short Cuts and Tips

FROM PS READERS

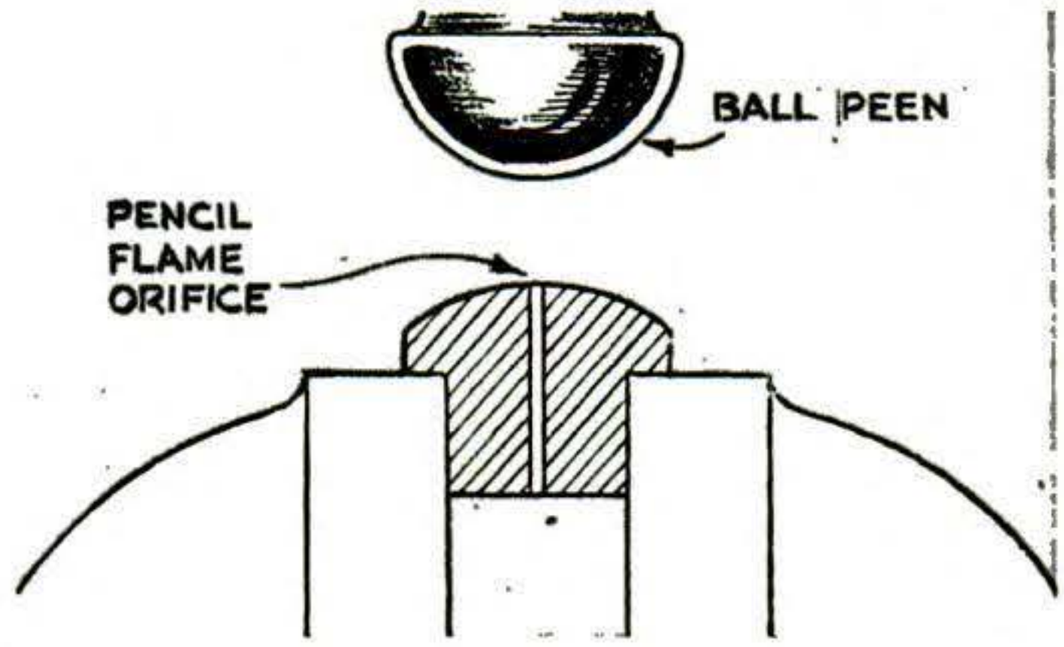
Truck Tool from Spring Leaf

A LEAF from an old car or truck spring is a versatile tool to keep behind a truck seat, and it takes little space. Cut the leaf to 36" and grind a bevel on one end. It makes a good lever for lifting the racks from a stake body, removing rocks from dual wheels, changing tires—in fact, for any job requiring leverage or prying force.—*Robert K. Glatus, Onaway, Mich.*



Template for Cabinet Hardware

POSITIONING hardware uniformly on numerous kitchen cabinets and drawers can be done accurately and fast if you use a plywood template. Drill holes in a template representing a corner of the door or drawer and put pencil marks through the holes to show screw locations.—*John Kelly, Cleveland.*



Reclaiming Worn Torch Orifice

AFTER long use, the pencil-flame orifice in a propane torch becomes so enlarged it can't retain its small flame. To reclaim the tip, chuck it lightly in a vise and carefully tap the area around the opening with a ball-peen hammer. Try the orifice in the torch after each blow—*F. W. Marasco, McKeesport, Pa.*

Indoor-Outdoor Cane Tips

ANYONE who depends on a cane will recognize the advantage of interchangeable tips—a rubber one for indoor use and a spike for slippery pavements. To make mine, I forced the male fitting from a shotgun-cleaning rod over the cane end. It takes but a moment to attach a mating fitting taped inside a crutch tip, or a similar coupling with a pointed steel pin attached to its lower end.—*Herbert L. Phillips, Watertown, Mass.*

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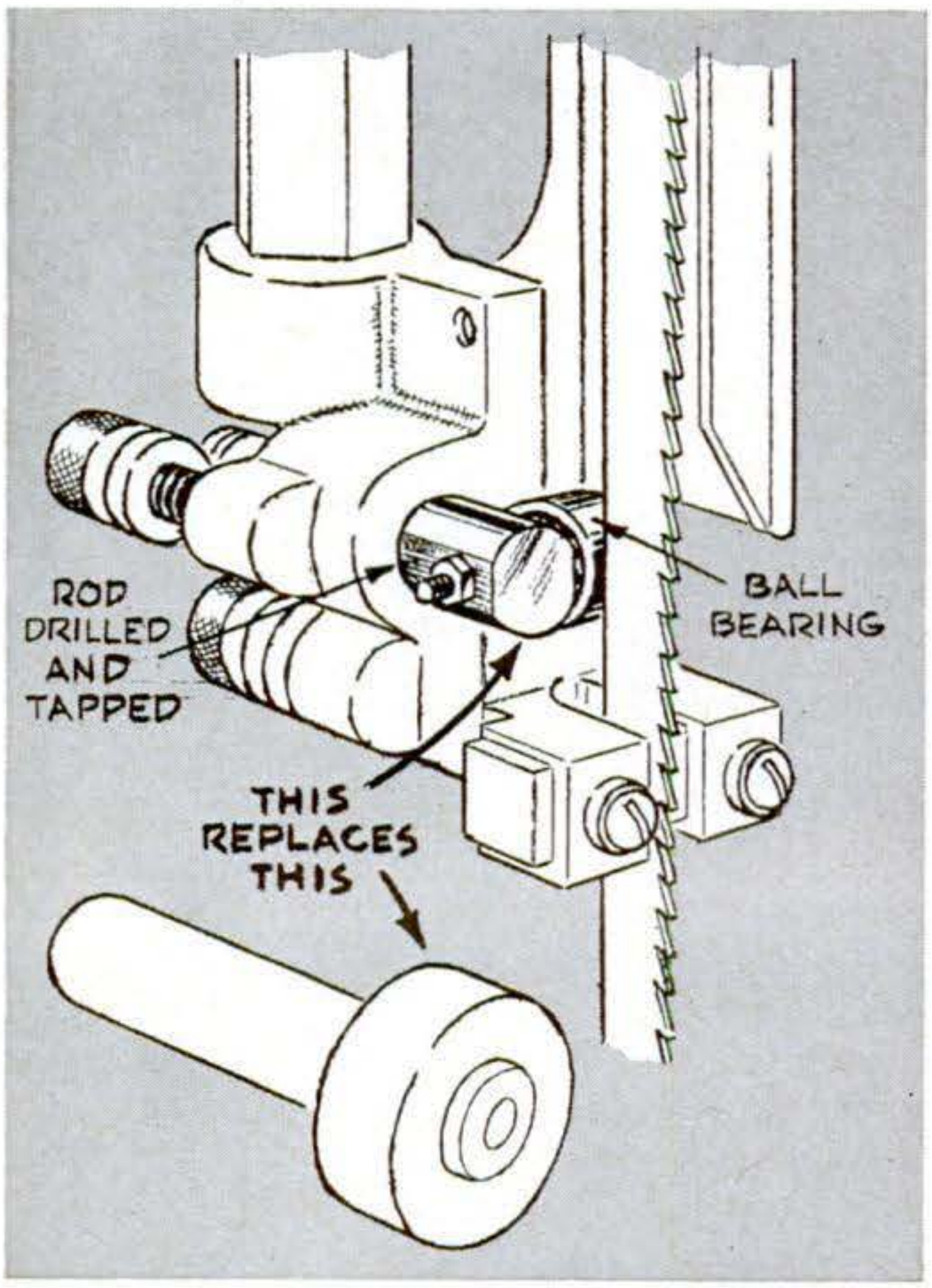
Short Cuts and Tips

FROM PS READERS

Worn Stairway Risers Renewed

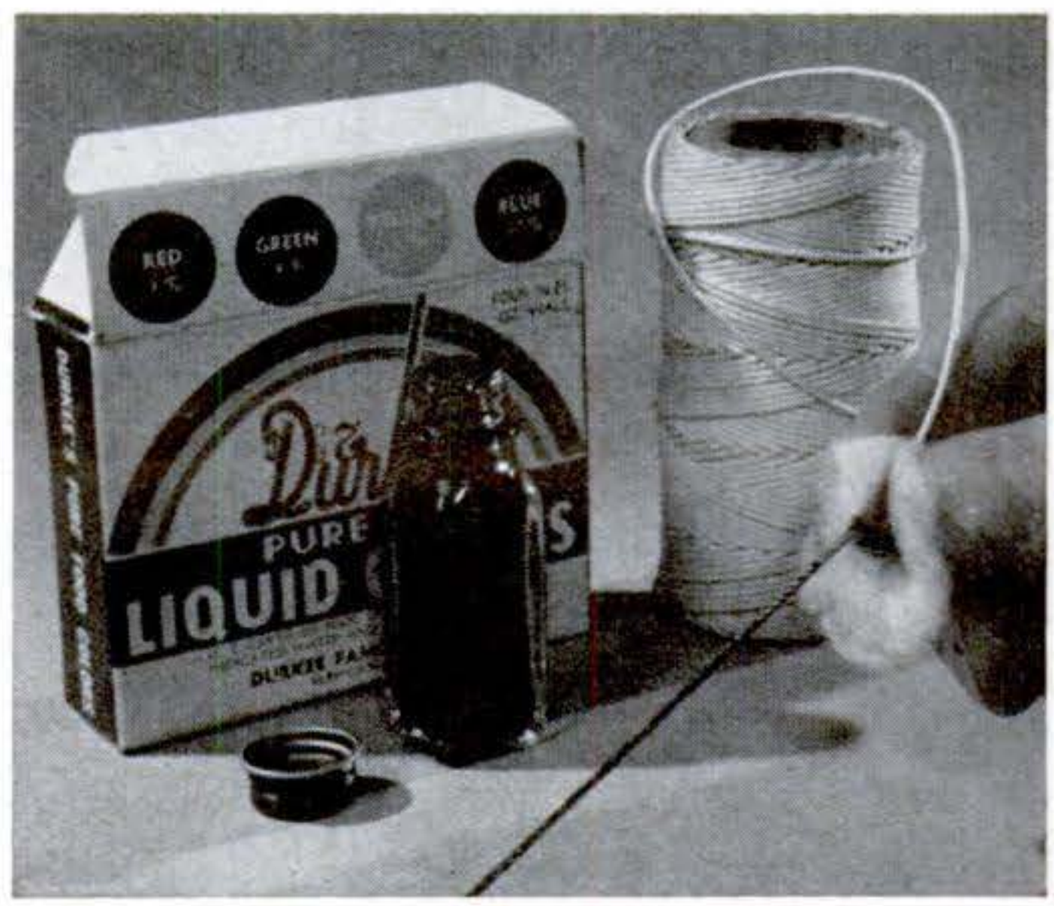
ARE the stairway risers in your home so badly worn by youngsters' flying toes and heels that they will no longer take a sanding? You can refinish them with linoleum floor covering having an imprinted wood grain. Cut panels to size and bond them to the risers with mastic.—*R. M. Woodbury, Natick, Mass.*



Quieting a Bandsaw

ON MANY bandsaws, a revolving disk is used to support the blade. However, the blade scrapes across the face of the disk and, if the disk stops revolving, wears a groove. You can make the saw run more quietly and save blade wear by replacing the disk assembly with a small ball bearing mounted on a length of rod. —*F. Harry Louden, Sarasota, Fla.*

▶▶▶A SECRET, simple lock keeps children out of my workbench drawer. It's just a bolt, dropped through a hole at the rear of the workbench top. The bolt enters the drawer and prevents it from opening. The bolt looks like it's there to hold the bench together but can be removed easily. —*David Hansen, Coronado, Cal.*



Cord Quickly Dyed Any Shade

ORDINARY white string can be dyed with food colors for colorful modelwork or fancy gift wrapping. For extra-fast drying, dilute the colors in rubbing alcohol instead of water. The four standard colors can be mixed to provide any shade you want. The string can also be waterproofed by rubbing it with a wax candle.—*James Kerry, Flint, Mich.*

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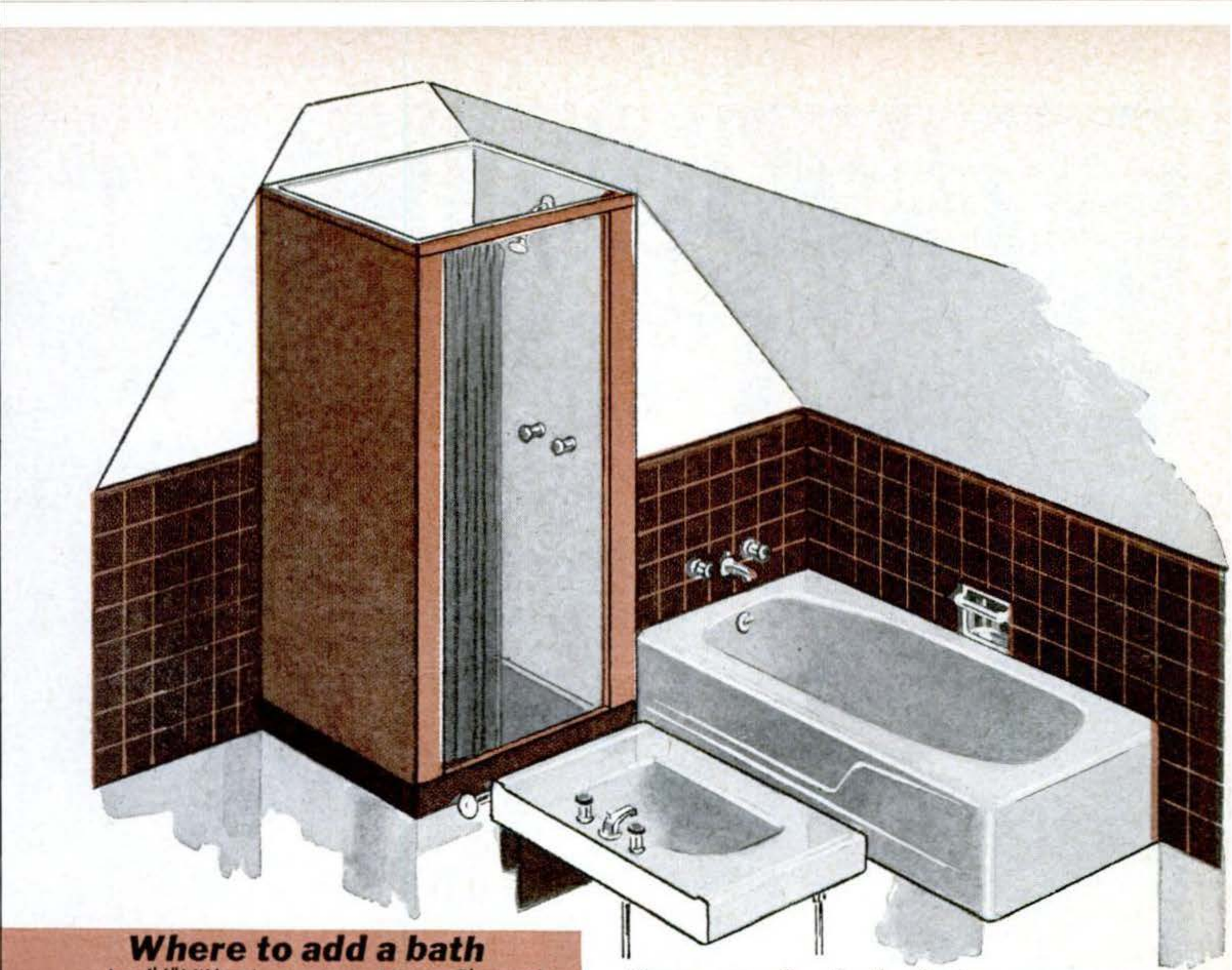

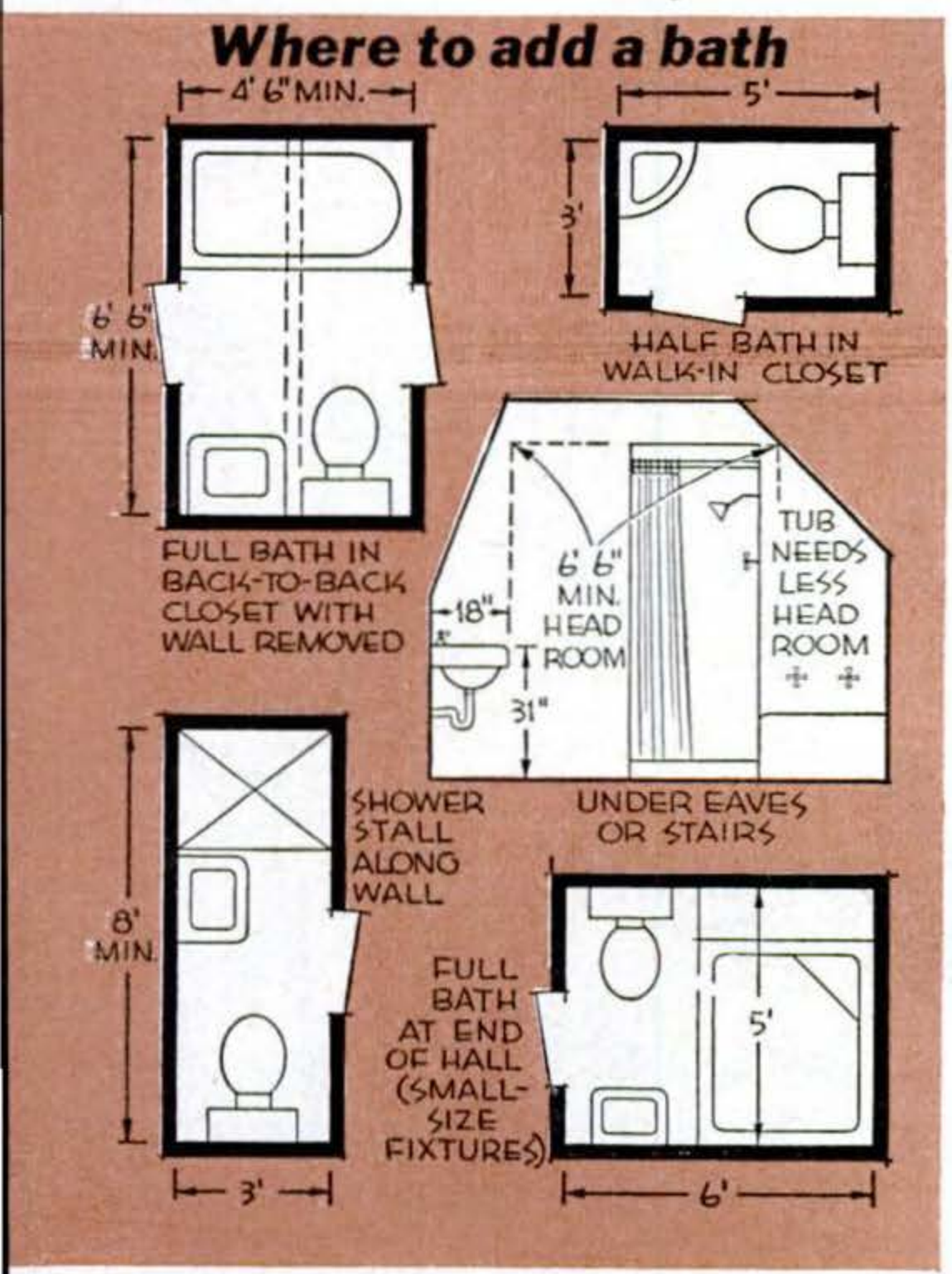

MINIMUM-SIZE LAYOUTS may fit into ready-made space in walk-in closets, or require wall removal. Note overhead clearance, as important as floor space.

Here are facts to help you come up with your own solution to—

Finding Space for That Extra Bathroom

By John L. Springer

CAN you fit another bathroom into your house? Probably yes, contractors say.

These experts maintain that a second or third bathroom can be squeezed into almost any house. Here are the facts and figures:

Bath fixtures fit into less space than most

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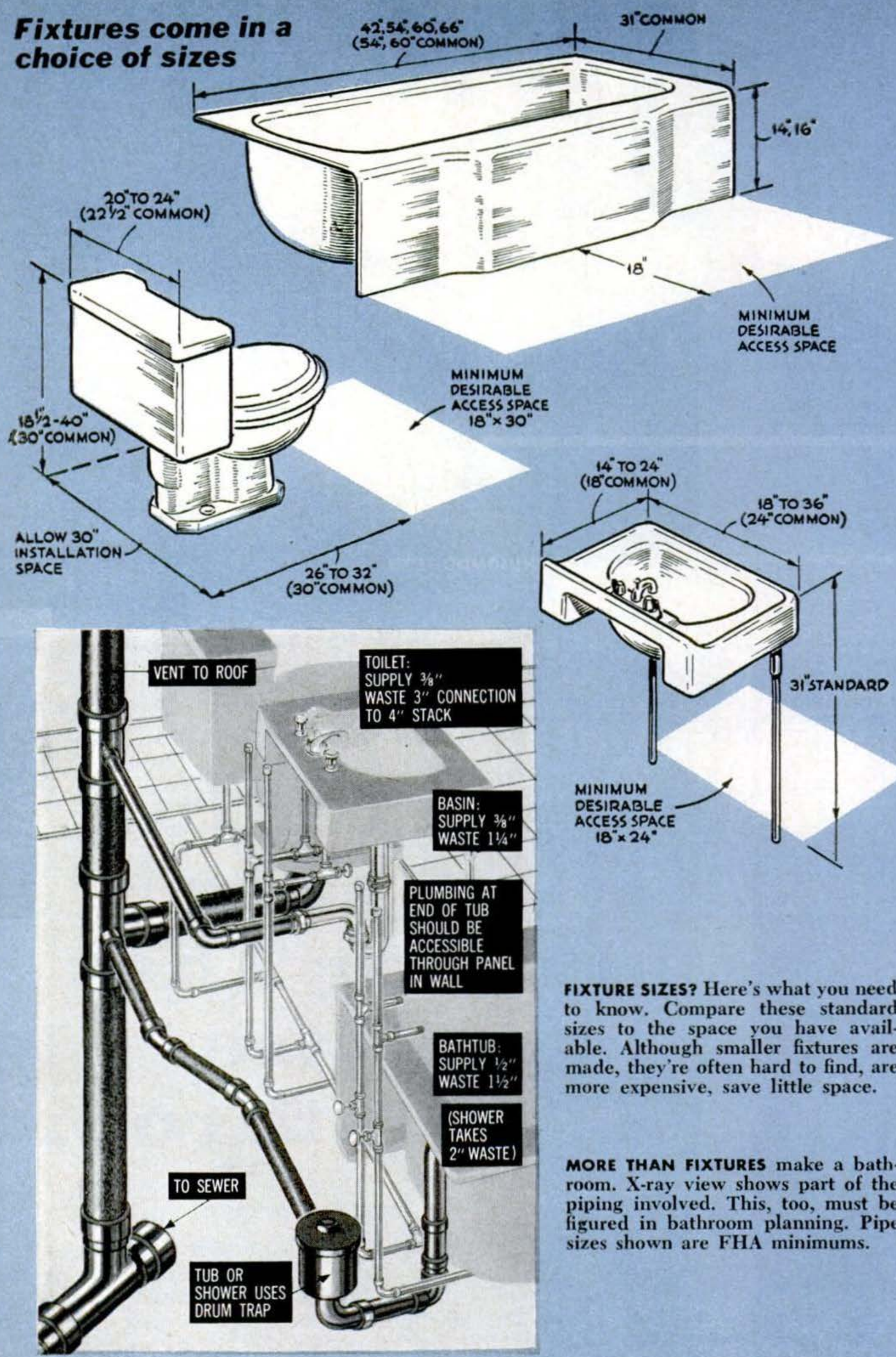
Fixtures come in a choice of sizes



FIXTURE SIZES? Here's what you need to know. Compare these standard sizes to the space you have available. Although smaller fixtures are made, they're often hard to find, are more expensive, save little space.

MORE THAN FIXTURES make a bathroom. X-ray view shows part of the piping involved. This, too, must be figured in bathroom planning. Pipe sizes shown are FHA minimums.

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people think. Into 25 square feet, you can squeeze a complete—if cramped—shower bathroom.

If you want a tub, you'll need a little more space. About the only concession you may need to make with these tight fits is to hang the door so it opens outward—into the hall or adjoining room.

Where will it go? Walk-in closets often can be turned into powder rooms or bathrooms without tearing down walls. If you have large rooms, stealing three feet from the length of one can make sufficient space. Sometimes a pantry can be spared.

A bathroom also can be put in a low-ceiling area. You can tuck one into the attic under the eaves. Just allow 6′6″ of head room for a shower; an even lower ceiling is okay for a tub.

The layout. You can design your own bathroom to match your space. A washbasin measures 24″ wide by 18″ deep; a toilet 30″ wide and 30″ deep. Both fixtures should have a minimum clearance of 18″ in front of them. Sometimes the same space will give access to both.

A small, stock shower stall measures 30″ square; a small bathtub, 54″ wide and 31″ deep. Access to tub or shower can be through the same space in front of the other fixtures.

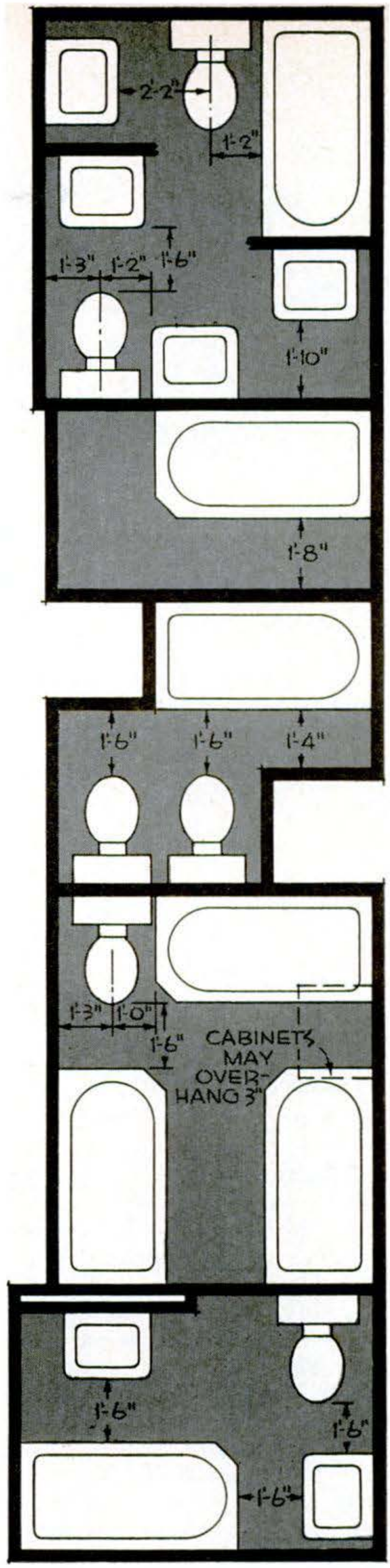
A few fixtures are made that will help you cheat on these minimums. There are bathtubs only 42″ wide, shower receptor-baths 39″ by 39″, and 4′-square diagonal tubs, some with a built-in seat.

Many small washbasins are available that protrude only 14″ into the room. Some small toilets are made, too.

But such shrunken fixtures can be hard to find, and they cost somewhat more than the standard models. Your best bet is to try the standard dimensions first.

Structural safety. Most houses are built with floor joists to carry a live load of 40 pounds per square foot. Ceramic tile with a mortar base weighs about 30 pounds per square foot, and some bathtubs weigh as much. It's obvious that a conventional bathroom will weigh more than an ordinary floor was designed to carry over a moderate span.

Good-quality two-by-eight fir joists 16″ on center—common floor construction—should not span more than 8′ if they must support 60 pounds per square foot. Two-by-10 joists will carry the same load on a 13′ span. You may have to reinforce



HOW TO SPACE THE FIXTURES: Plans show minimum desirable clearances between fixtures, or fixtures and walls, regardless of layout.

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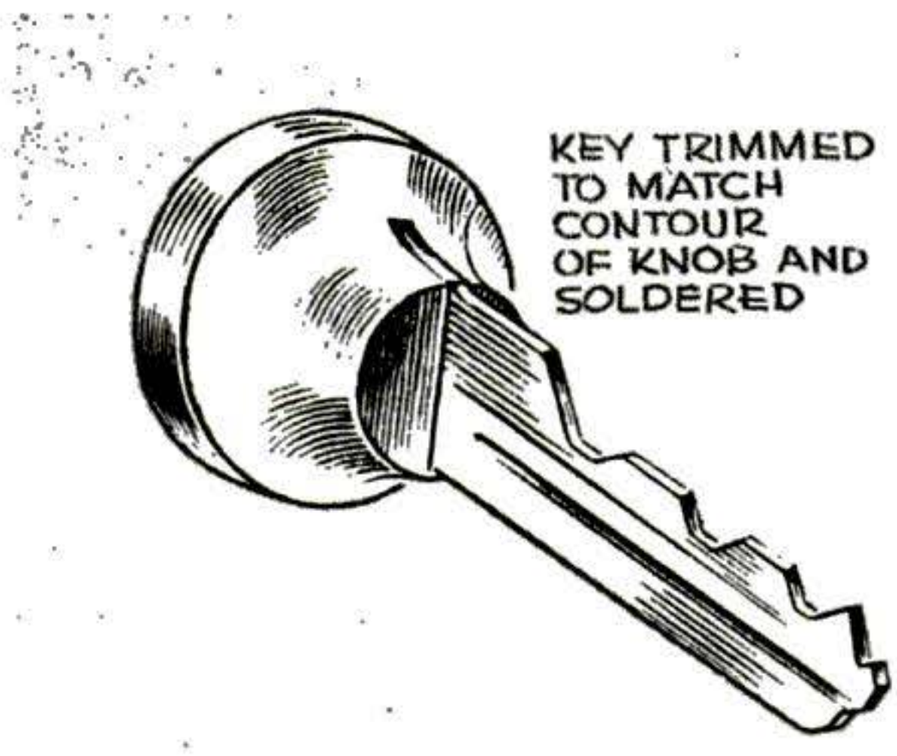
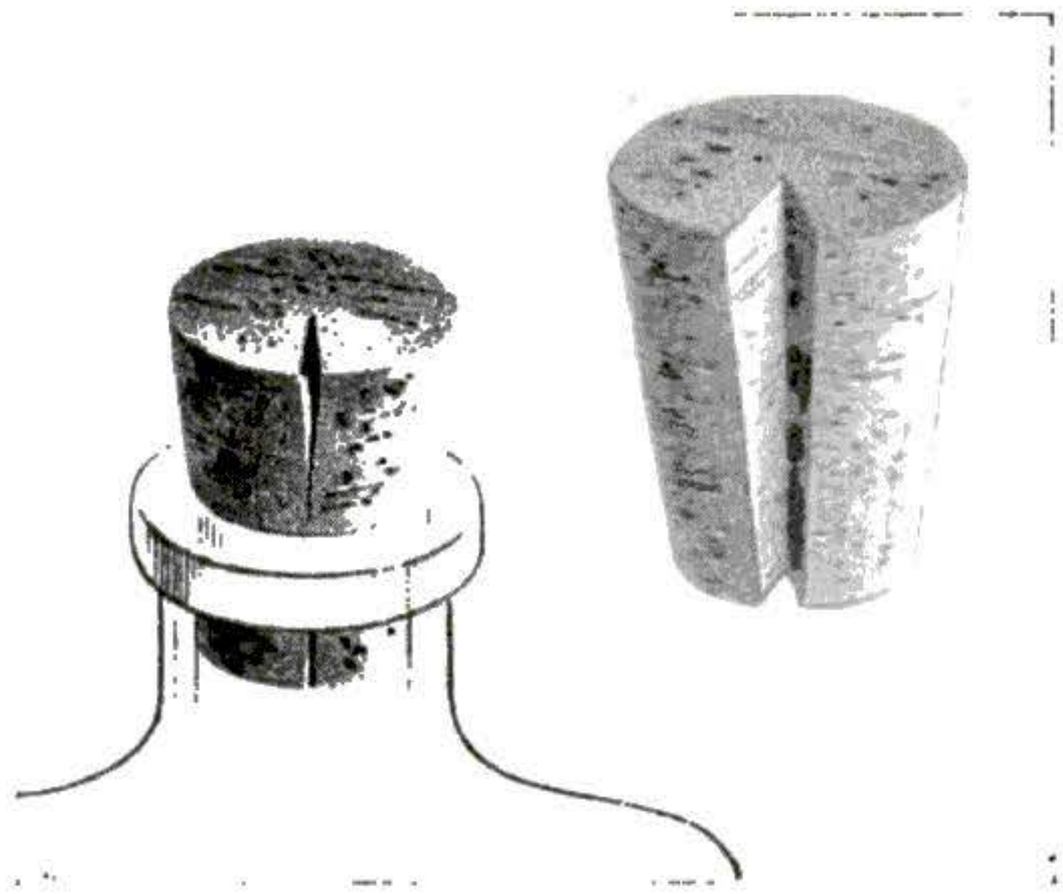


Hiding a Key with a Knob

I DIDN'T like the looks of a plain key sticking out of the lock of an infrequently locked cabinet door. So I sweat-soldered the shank of the key into a slot hacksawed into a matching brass knob. The resulting combination looks like any other knob on the cabinet. When we want to lock the door, we merely turn and remove the key. It's hard to lose, too.—*Edward H. Schmidt, Baltimore.*



Large Corks Made Smaller

A CORK that's too large to fit in a bottle can be reduced to proper size by cutting a tapered slot in the side. The cork will squeeze closed as it is inserted. —*Daniel Bousha, Jackson, Mich.*

▶▶▶I SAVE cardboard milk cartons, cut the top off about 4″ from the bottom, and use the resulting box as a disposable paint container.—*B. S. Peavy, Los Angeles, Cal.*

the joists if you intend to use cast-iron fixtures and ceramic tile set in mortar.

The easiest way out, for a first-floor bathroom, is to cross the center of the floor joists with a supporting beam. The joists' weakest spot—the center—will rest on this beam. A four-by-10 beam almost surely will carry the added weight. Support it at its ends with four-by-four posts at least, or steel columns.

Strengthening second-floor joists takes more doing. Usual procedure is to remove the flooring and nail extra joists to existing ones. These must be supported at both ends by the bearing partitions. You probably won't have to double more than six joists to get sufficient strength.

An alternate method of reinforcing the floor—and incidentally providing space for pipes—is to build a platform floor above the present one. This means a step up to the bathroom floor.

If your building inspector okays it, you can avoid reinforcing the present floor by using lightweight materials. Tile set in adhesive instead of mortar, wallboard instead of tile, and enameled-steel instead of cast-iron fixtures will help save weight. Basement bathrooms don't usually present structural problems.

The plumbing. Theoretically, you can put plumbing wherever you like. But when you add a bathroom, you must tie into existing pipes.

Try to add your bathroom under, over, or next to another bath, kitchen, or laundry room. The farther you go from existing plumbing, the higher the costs. And the closer you are to old plumbing, the easier it is to hide new pipes.

You may have to run the pipes in odd ways to avoid weakening your studs or joists. According to new minimum standards just adopted by the FHA, you can't notch wall studs more than one-fourth of their depth, or drill through their wide face more than 1¼″ in a 4″ stud, or 2″ in a 6″ stud. Otherwise, you'd have to reinforce them by running a steel plate over the notched area.

You can notch joists in the top or bottom surface, but only in the end thirds of the span. The notch can't be more than a sixth of the depth of the joist except when it's made practically next to its support. You can bore holes up to 2″ in

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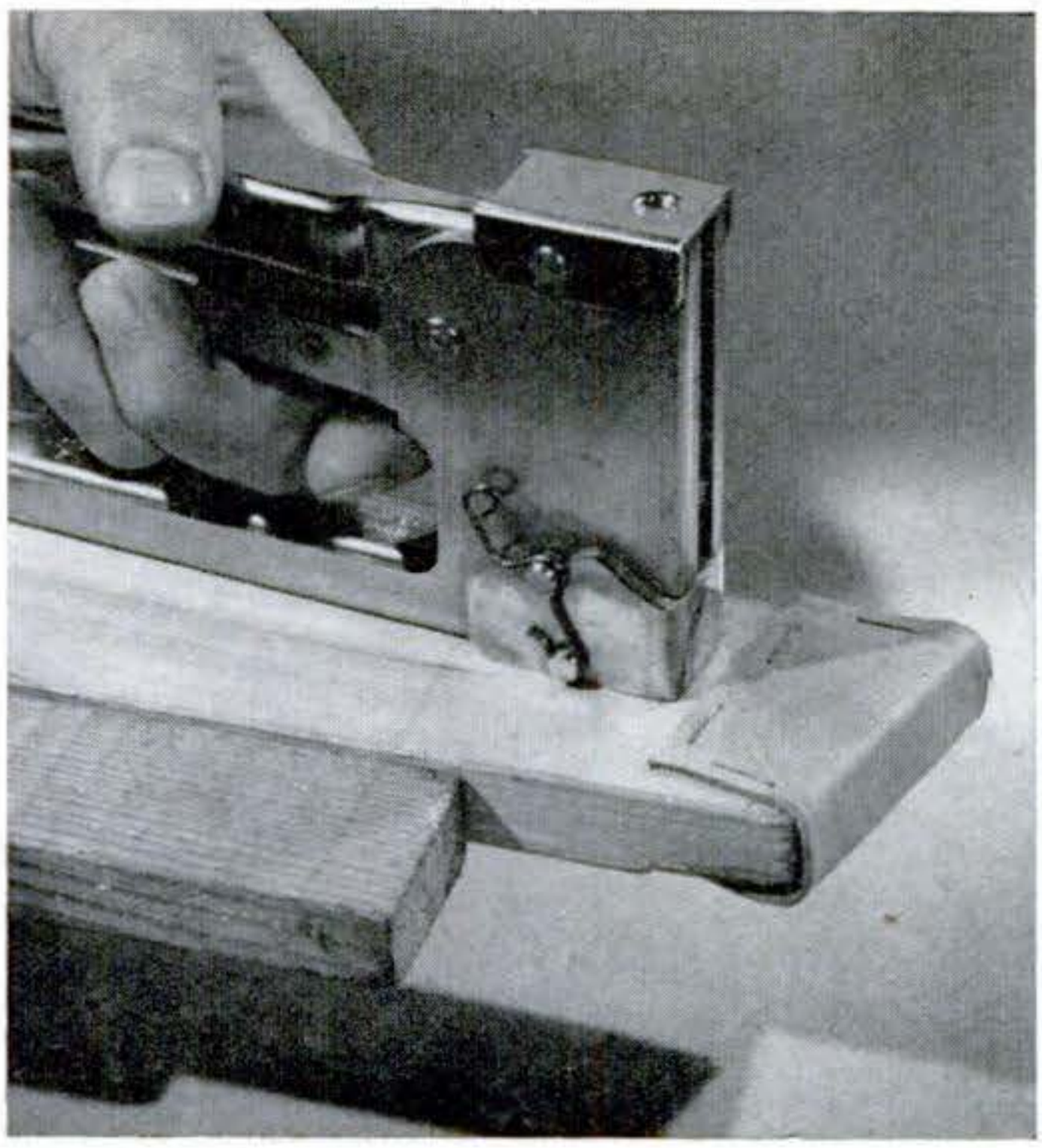
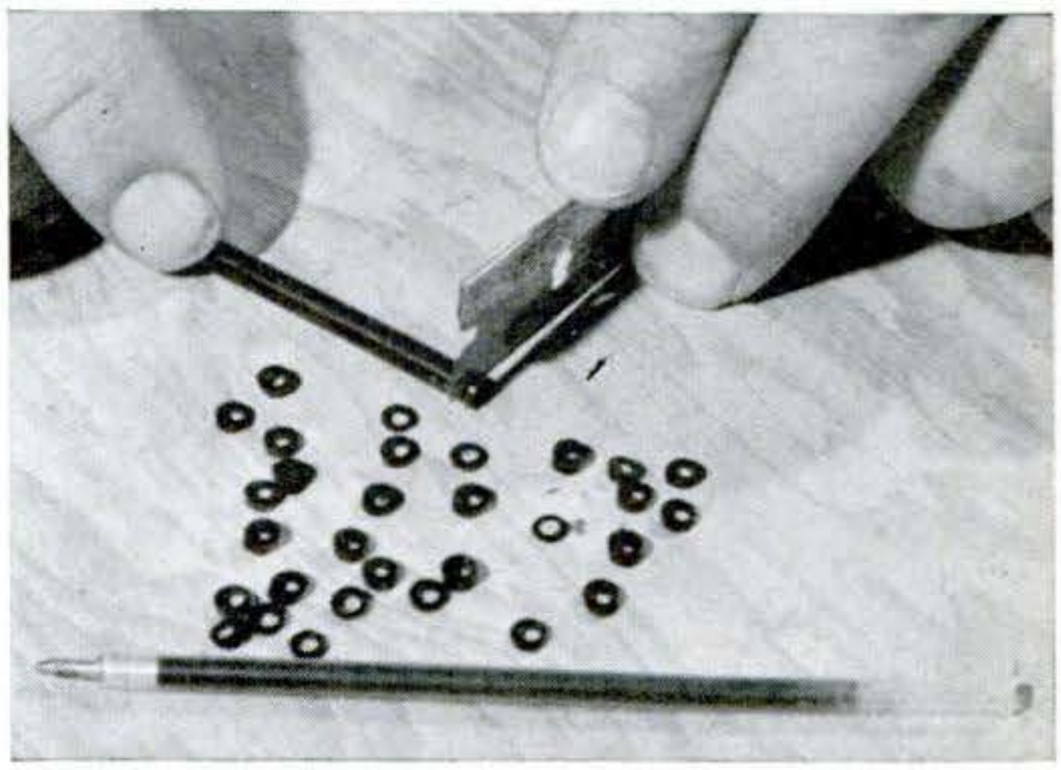
Short Cuts and Tips

FROM PS READERS



Non-Skid Stepladder Feet

BEFORE using a stepladder indoors on a polished floor, staple pieces of inner-tube rubber over the feet. The rubber also will prevent slipping when the folded ladder is stored by leaning it against a wall.—*Ken Mason, Grand Rapids.*



Miniature Washers for Models

TINY rings sliced off an old plastic ball-point-pen cartridge make ideal washers for models. They compress enough to act as lock washers when tightened or can be oiled to serve as bearing washers.—*Ben Morrison, Toledo, Ohio.*

diameter to within 2″ of the joist edge.

The practical effect of these rules is that you can run water pipes but not sewer pipes through joists. Waste pipes have to go under, over, or between the joists in floors and ceilings.

In a basement, there's just one place for the waste-disposal line—under the floor. The most practical way to tie into existing sewer lines is to chop up the concrete floor, lay the new line, then re-cement. The closer your bathroom is to the main stack and water lines, the easier the job will be—and the cheaper.

Most local codes specify sizes and types of pipe you must use to carry water to fixtures and take waste away. Sometimes the codes don't make much sense. For instance, New York City requires water pipes of galvanized iron. In the surrounding suburbs, local officials demand copper. Some places let you use ⅜″ tubing to supply each fixture. Elsewhere the tubing must be ½″ or even ⅝″.

A quick way to find out what probably applies in your town is to check the sizes of existing pipes.

Most codes also require that the waste line for each fixture contain a trap—a U-shaped fitting to seal sewer gases out of the house. Behind each trap, there must also be a vent pipe running up to the roof and open to the air.

Windowless baths. Bathrooms deep inside the house are increasingly popular. They give you more freedom in locating a bath and, of course, no window means no drafts in tub or shower.

The advantages offered by windowless baths in location convenience and economy, plus recent developments in skylights and vent fans, have made them more than acceptable today.

Ventilation is automatic when you use an exhaust fan that turns on with the light switch. As long as you have such a fan, an interior bathroom will get the okay of most lending institutions.

Just observe these common regulations: Install a fan that will change the air completely every five minutes. (Figure the fan's rated capacity against the volume of the bathroom.) Provide incoming air for the bathroom by inserting a grille in the lower part of the door or wall, or by undercutting the door.

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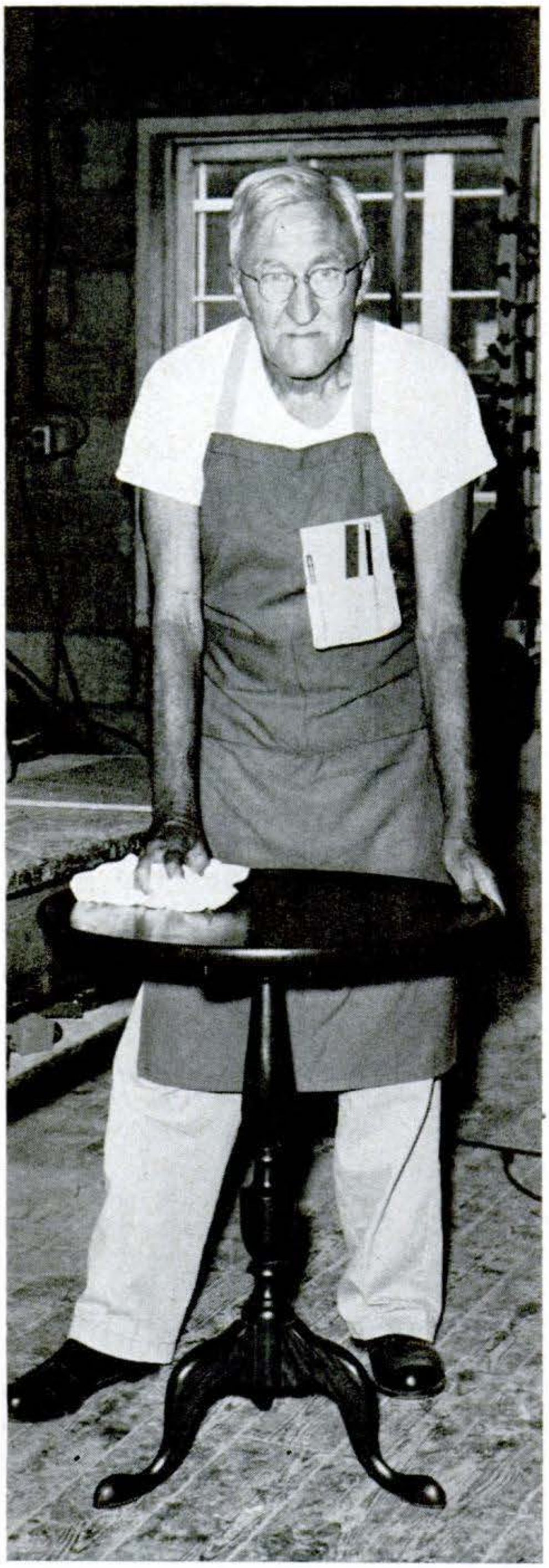
An Old-Timer's Formula for Fine Wood Finishing



R. C. STANLEY at work on a fine table in his shop in Canton, N. C. His experience in woodworking—and wood finishing—dates back to 1902. In recent years, tourists have carried his handiwork home to all of the states and several foreign countries.

By R. C. Stanley

WOOD finishing as I practice it is always fascinating. Over the years I have developed a natural finish that brings out, in depth, all of the beautiful natural colors and shades of color in any dry wood. The finish also creates in the comparatively short time of two to 12 months a patina that equals natural aging for 100 years or more.

I call it Wonderlux Wood Finish. Properly done, it lives up to the meaning of "wonder" and "lux." A potash solution is its base. Numerous employees have used the finish in my shop, but none knew the makeup of the solution. I have now decided to pass full knowledge of it on to others.

Patina forms quickly. All woods contain varying amounts of albumin. A natural patina comes from a film of albumin forming on the surface. It is believed that a photochemical action draws the albumin to the surface. The potash solution speeds up the process by combining with albumin and drawing it to the surface. It does this in days or weeks instead of years.

The patina forms more rapidly on most softwoods than on hardwoods. When the patina film has formed, chemists can find no difference between it and the film created by 100 years or more of use and exposure to light. Result: the same coloring and mellowness of wood grown beautiful with age.

That, briefly, is patina. But I still don't understand, after all the years of using it, how and why the potash solution brings out the natural colors in wood. I know only that it happens.

In 1913 I established my own cabinet

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shop. At first I copied the master craftsmen in all details except the fine hand carving, which I could not master. Sheraton and our own Colonial designs and construction suited me most. I combined what I thought was the best in design and construction in these, and came out with a style that has sold to tourists from all of the states and several foreign countries. My natural wood finish solved the main problem of decoration.

Hand carvings and moldings were easily and profitably eliminated by the artistic use of figured-wood overlays. Used as overlays, crotch woods in mahogany, walnut, cherry, mulberry, apple, white pine —indeed, almost any wood—are all superior to carving in my eyes. The overlay exposes all of the figure and natural colors of the wood.

Beauty in a pine knot. You might saw a white-pine knot lengthwise through its center, then take a piece a quarter-inch or so thick from each half and fit the edges together to form an overlay. After the finish is applied, the pine knot shows natural fiery reds and other colors of medium and high brilliance, feathering out into many delicate shades of color.

Traditionally, wood has been used with a preconceived idea of covering it up with stains, paints, and most anything that will hide it. Home builders hire expensive decorators to tell them which colors and combinations of colors, in paints, varnish stains, and what not, will most effectively hide one of the most beautiful natural creations: wood.

Experience is the best teacher—in wood finishing as in other endeavors. A half-century of experience lies behind this article

My Wonderlux is about the least expensive finish I know of. It does require time and elbow grease. But consider what you get in return—a natural-wood color that blends perfectly with any color in rugs, carpets, upholstery, drapes or linoleum. No need of a decorator there.

Any previous finish must be removed, preferably by scraping lightly. Parts that are difficult to scrape may be cleaned with varnish remover and a stiff bristle brush, followed by garnet paper or coarse steel wool, or both.

It's a three-step finish. Wonderlux finish requires three separate operations with three materials.

The first material to be applied to the wood is a mild solution of potash in water. Crude potash, obtained by leaching wood ashes, is preferred. But since

Mr. Stanley's Finishing Formula in Brief

STEP 1. Rub in a mild solution of potash after the wood has been prepared by sanding it smooth. Give hardwoods a second application after the first is thoroughly dry. Rub down the surface with a dry cotton rag on frequent occasions for several weeks. This step gives the wood surface a patina.

STEP 2. Make a mixture of equal parts of clear spar varnish, kettle-boiled linseed oil, and turpentine. After sanding the surface lightly to remove the raised grain, rub in this mixture thoroughly with a lint-free cotton cloth. Squeeze out the cloth and rub the wood surface vigorously until it looks dry.

STEP 3. Give the piece two or three waxings several weeks apart with a good paste floor wax, rubbing each one down well before applying the next. Thereafter liquid wax can be used if desired.

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wood ashes are not always obtainable, a mild solution of a purified potash known as "pearlash" can be used. A "mild solution" is one that feels slick, like soap, between the thumb and finger.

Pearlash is a white solid obtained at drug stores. It is gradually added to the water and dissolved until it becomes slick No specific strength is required, but one ounce of pearlash to a gallon is a good solution in soft water; hard water requires a bit more. For the hard, close-grained woods, the solution should be somewhat stronger than for soft, more porous wood. (Do not put the solution in a plastic or aluminum container.)

The potash solution may be applied with a paintbrush. I prefer to wear rubber gloves (it discolors the fingernails otherwise) and rub the solution into the wood with a cotton rag. The aim is a uniform saturation of the wood surface with as much penetration as possible. The solution will cause only slight discoloration of the wood surface. Hardwoods should be given a second application after the first is thoroughly dry, and allowed to dry from four to 10 days.

Since wetting the wood surface will have raised the grain, you will need to remove the fuzz. Do this with 0000 garnet finishing paper or fine steel wool.

Wood treated only with the potash so-

[*Continued on page 244*]

путешествий нужно разработать иные способы, например использование растений, кото-

смелому и самоотверженному исследователю, борцу и строителю коммунизма, будет открыт путь в космос.

БЕЗ ПОМОЩИ ЭКСПЕРИМЕНТА

Два одинаковых болта приложены друг к другу (см. рис.). Если начать вращать один болт вокруг другого, взявшись за их головки так, чтобы болты не вращались относительно их собственных осей, то: а) головки болтов начнут сближаться, или б) головки болтов начнут удаляться друг от друга, или в) расстояние между головками останется неизменным.

Условие: решать эту задачу надо в уме.

2 «Юный техник» № 5

* Гей, Русские! Вот Наше Решение Вашей Задачи

*Hey, Russians! Here's Our Solution to Your Puzzle

THE hen tracks above are a reproduction of an interesting mechanical puzzle that recently appeared in a Russian magazine, *Young Technician.*

Two identical bolts (it says there) are placed in contact as shown. Suppose you begin to rotate one bolt around the other, holding their heads in such a way that neither can turn upon its own axis. Then: (a) the bolt heads approach each other, or (b) they draw apart, or (c) the distance between them remains unchanged. Which is it? The puzzle is to be solved without experimentation.

The answer appears on page 213 as it was given in the Russian magazine. But even if you can read it, you may find it disappointing. It tells what happens but fails to show why.

After you've decided on your own answer and the reason for it, turn to the translation of the Russian solution and PS's own (and we think better) explanation, also on page 213.

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Short Cuts and Tips

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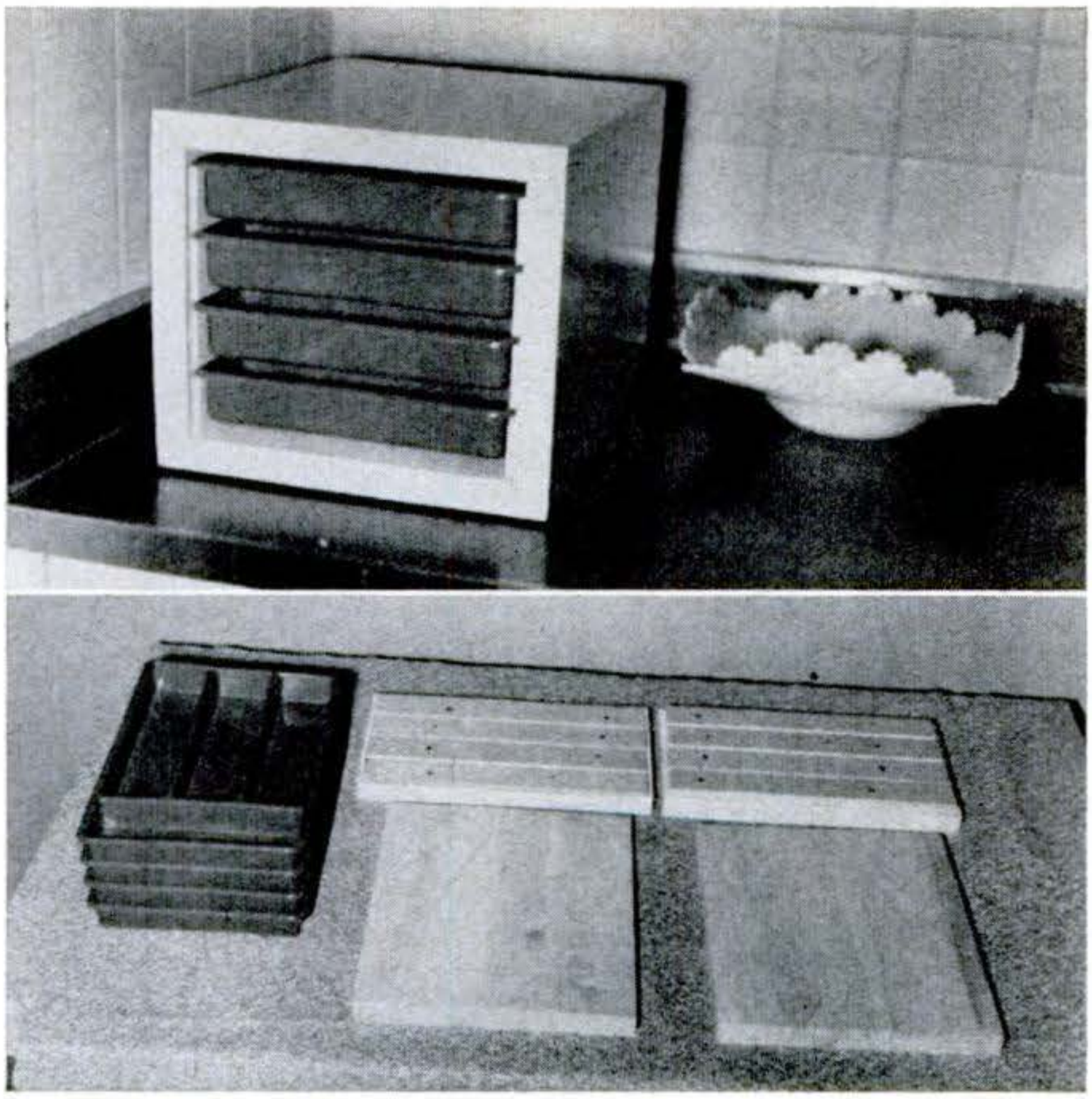
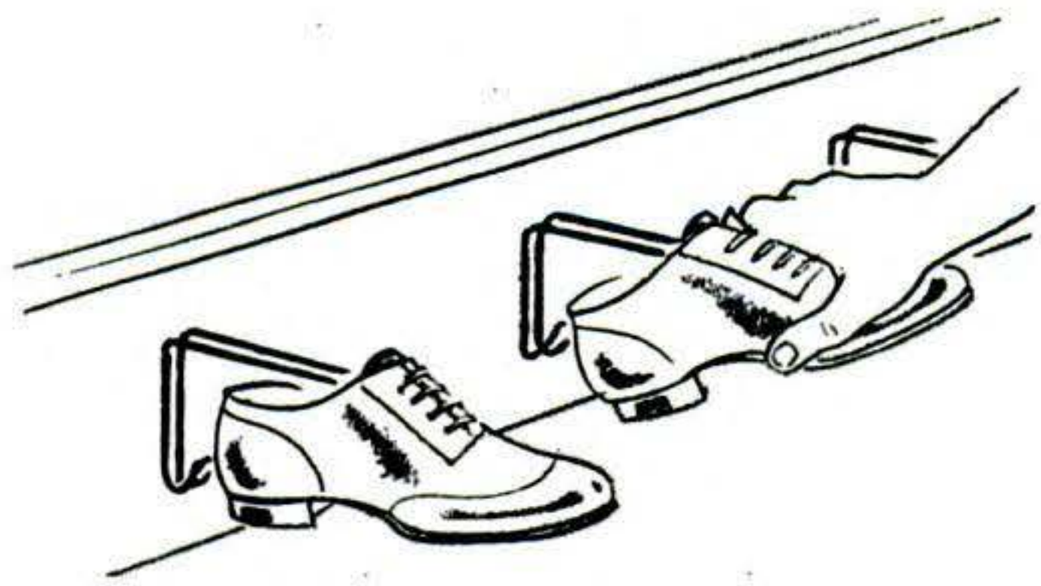


Counter-Top Cabinet for Silver and Cutlery

THREE or four plastic silver trays and plywood or lumber scraps are all it takes to make this counter-top cabinet for silver or cutlery. Cut dadoes in the sides, or attach cleats of thin plywood, to make drawer guides for the trays. The case may be painted to match or contrast with the plastic trays or the kitchen cabinets.—*James A. Lockhart, Bryan, Ohio.*

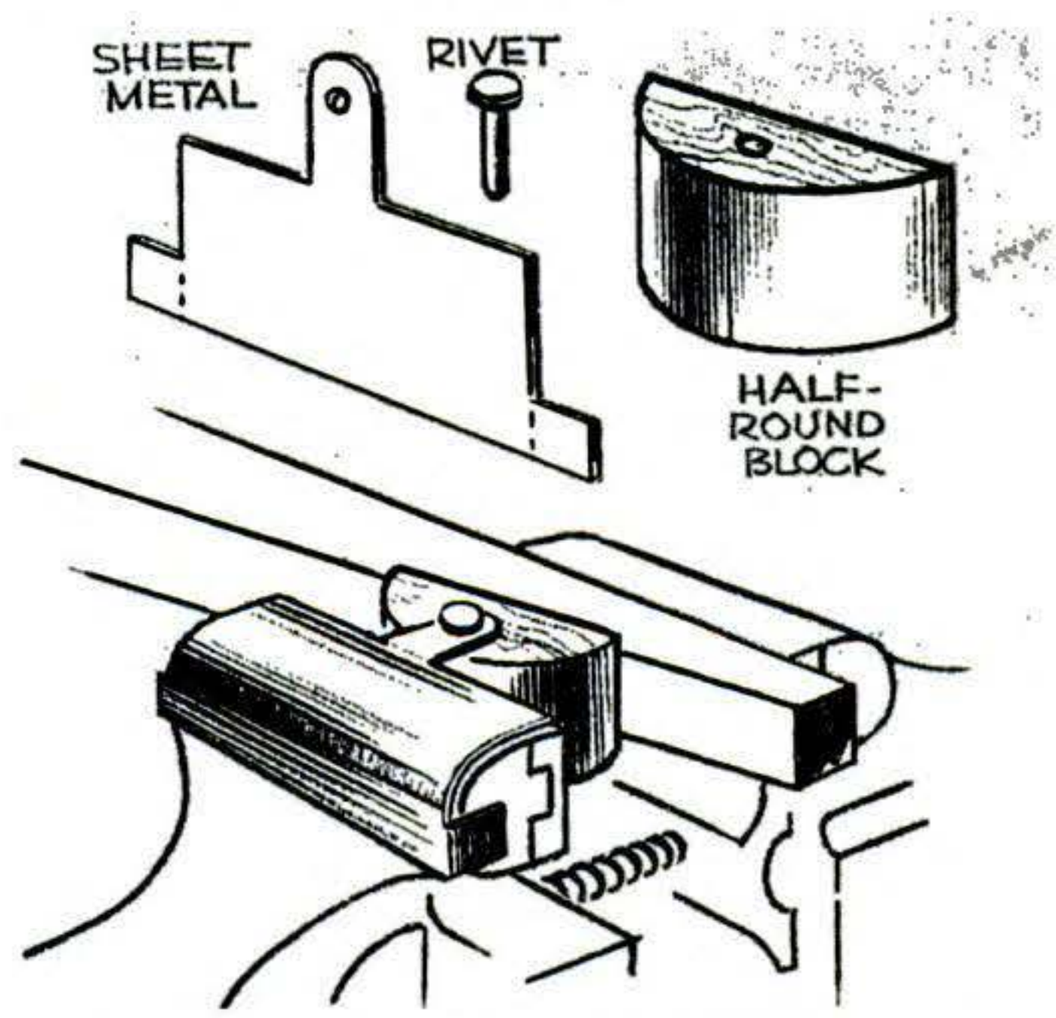
▶▶▶GLUE containers without caps can be sealed easily and effectively by placing a small piece of heavy paper over the hole. This keeps out air, and is easy to remove.—*Frank H. Kelly, M.D., Argos, Ind.*



Hanging Shoes in the Closet

IF YOU need an extra rack to hold shoes and slippers, screw a row of wire coat hooks along the closet baseboard. Each hook will hold a shoe off the floor.—*Robert Woods, Athol, Mass.*

▶▶▶AFTER applying the finishing coat to a freshly laid sidewalk, we troweled tree leaves into the wet surface along the edges. When the cement set, we washed away the leaves with a garden hose. They left an attractive patterned border, as permanent as the walk itself.—*Verda Ross, San Bernardino, Cal.*



Adapt Vise for Tapered Work

AN ATTACHMENT that clamps over one jaw of my vise makes it possible to grip tapered pieces. One of its two parts is a half-round block cut from a short length of round bar stock. It is drilled through the center to take a pivot pin—a cold rivet works fine.

The other part, made from sheet steel or brass, fits around the outside of the vise jaw and is connected to the half-round piece through the pivot pin. By pivoting, the half-round piece adjusts itself to hold any tapered work.—*William E. Duggan, Fairfield, Conn.*

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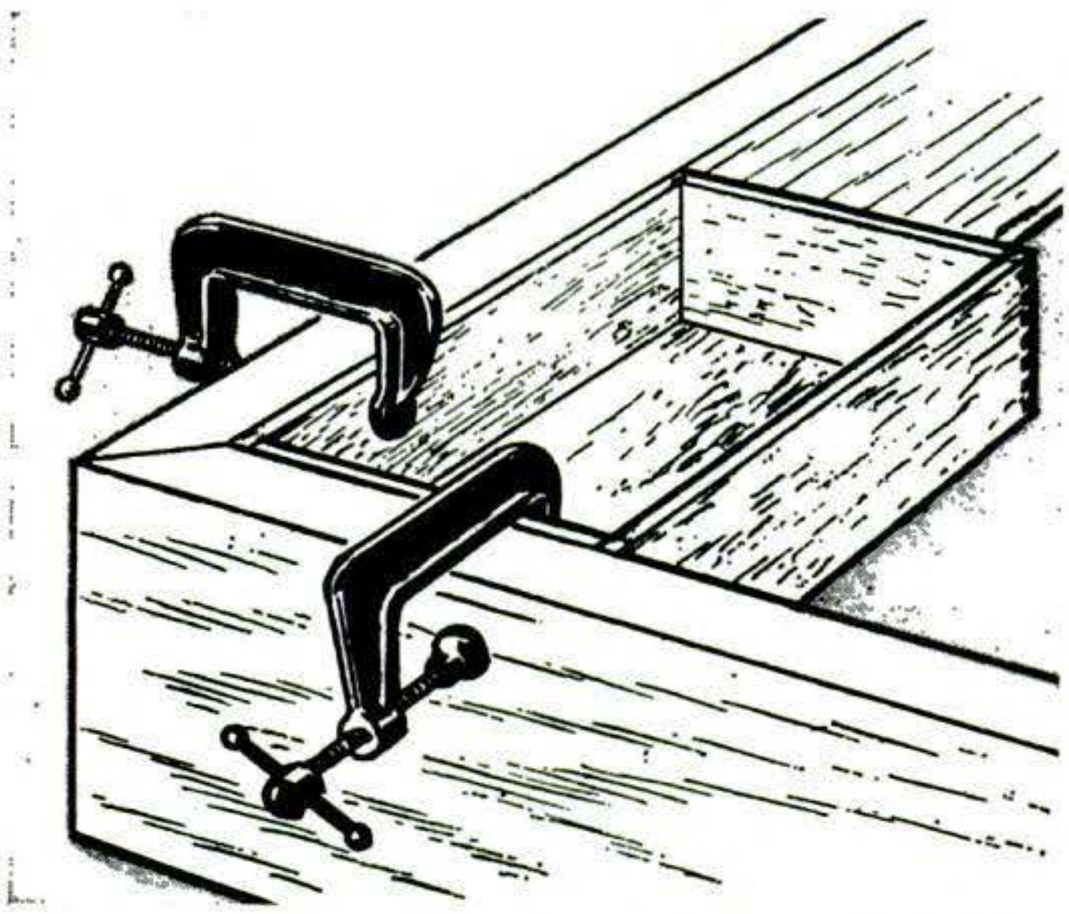
Short Cuts and Tips

FROM PS READERS

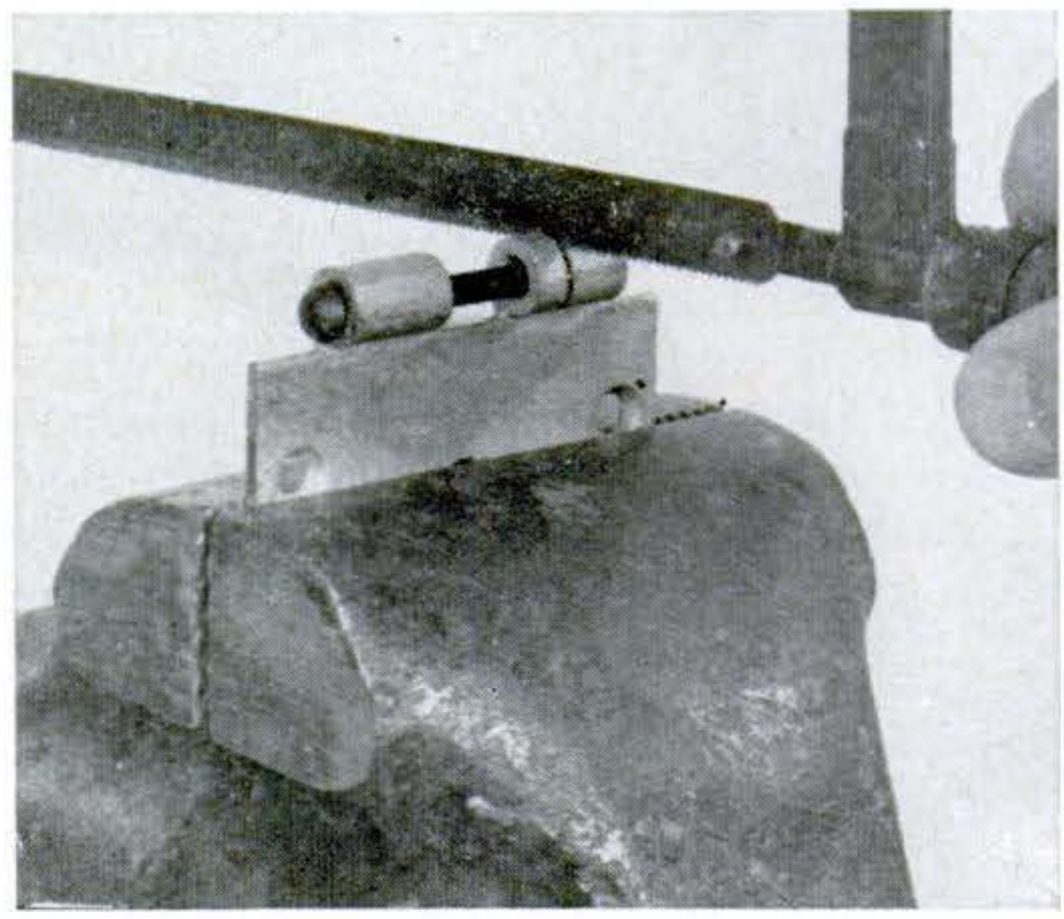
Identifying Side of LP Disc in Dark

TO IDENTIFY the first side of an LP record, even in poor light, I stick a gummed loose-leaf hole-reinforcement ring on the label. The rings can also be put on the favorite sides of popular records.—*Joseph S. May, Brooklyn, N.Y.*



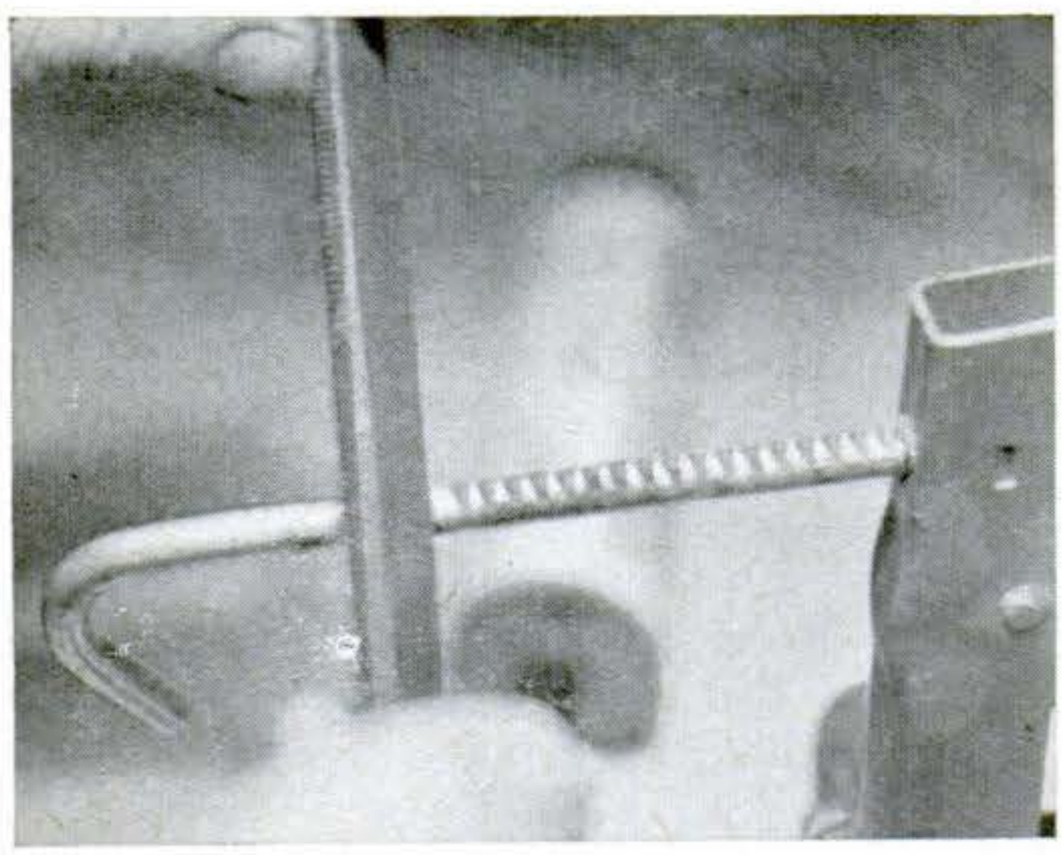
Gluing Miters with Cigar Boxes

MITERED joints in light stock may be held together for gluing by clamping them to coverless cigar boxes. If the stock is light enough, a single box can serve four corners if it is cut into sections.—*G. E. Hendrickson, Argyle, Wis.*



Bolt-Cutting Made Easier

A JIG made from a half-hinge will simplify and speed up cutting a number of bolts or rivets to uniform length. Clamp it in a vise and saw a slot at the point where you wish to cut the bolts or rivets. —*Bil Tolman, Palatine, Ill.*



More Calking from the Gun

SOME calking-gun plungers can't be ratcheted far enough forward to force the last bit of compound from the cylinder. Two or three extra notches hacksawed and filed in the rear of the push rod fix this.—*Ray Mocre, Wellsville, Ohio.*

▶▶▶WHEN removing heavily painted screws from moldings and fixtures, I first dab paint remover on the screw head. This softens the paint in the screwdriver slot, and breaks the seal holding the screw.—*Robert H. Kleinhenz, Dayton.*

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ANOTHER FRESH ONE FROM PONTIAC REVS UP A NEW KIND OF EXCITEMENT FOR 1960

Here, without question, is the most provocative package of road machinery ever to bear the respected name of Pontiac.

Coming and going, the 1960 Pontiac exhibits a clean, classic look that has even the most avid customizers nodding their approval. Here is total artistry in automotive design, shaved and sharp.

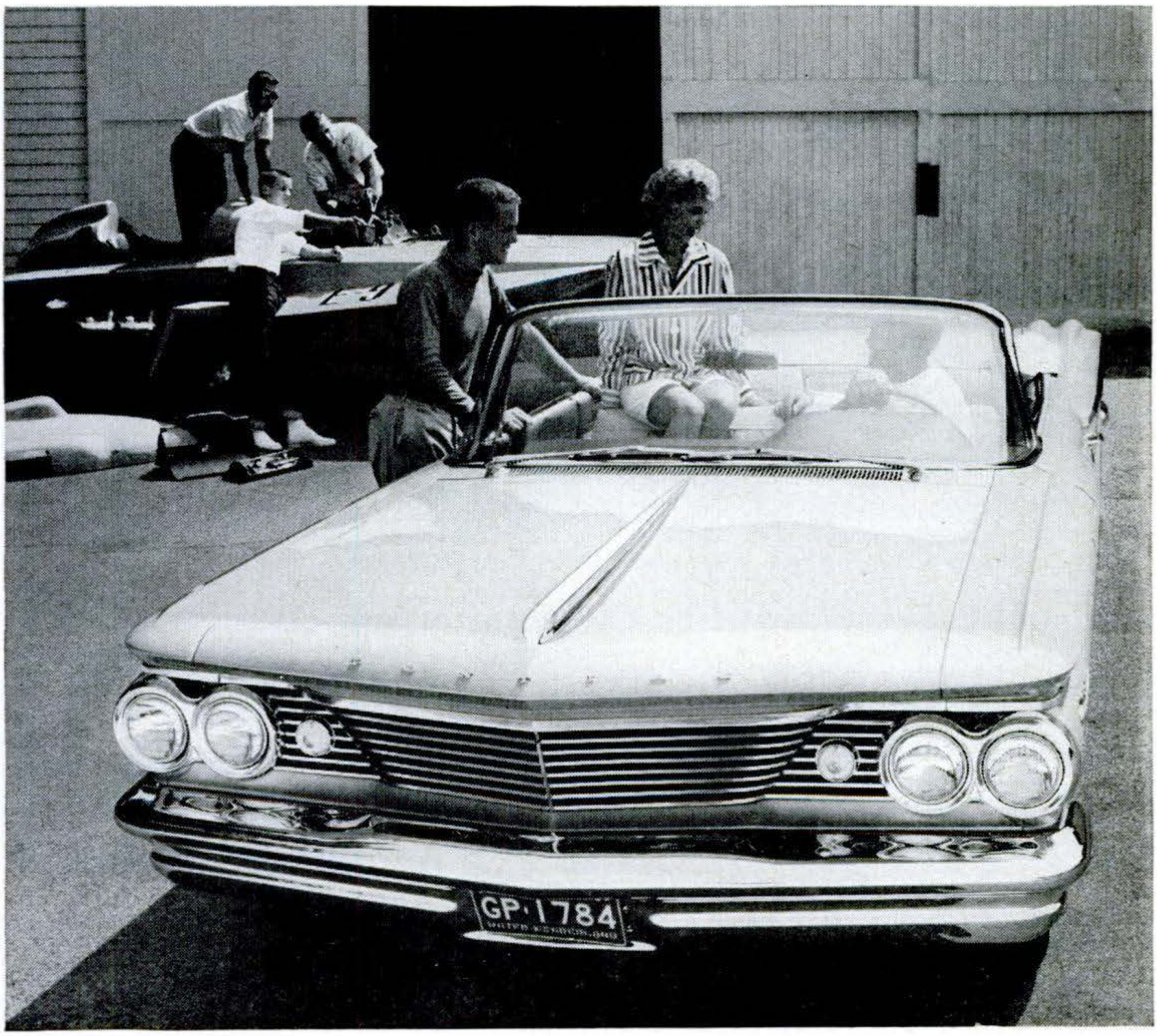
For unmatched action, tap the resources of the Tempest 425 with Tri-Power! This fiery, famous power plant is one of a wide range of power packages available in the 1960 Pontiac. Every one is a finely honed version of the respected 389 cubic inch Tempest and one (the 425E) performs on regular gas.

Tie this Tempest-tended performance to Pontiac's Wide-Track Wheels . . . and you've got the most exciting and road-wise passenger car you've ever hustled or handled.

See your Pontiac dealer soon. Rev up a Fresh-Point-of-View Pontiac and put it through its paces. You'll heartily endorse it as the most satisfying production passenger car of 1960.

PONTIAC MOTOR DIVISION • GENERAL MOTORS CORPORATION

PONTIAC THE ONLY CAR WITH WIDE-TRACK WHEELS



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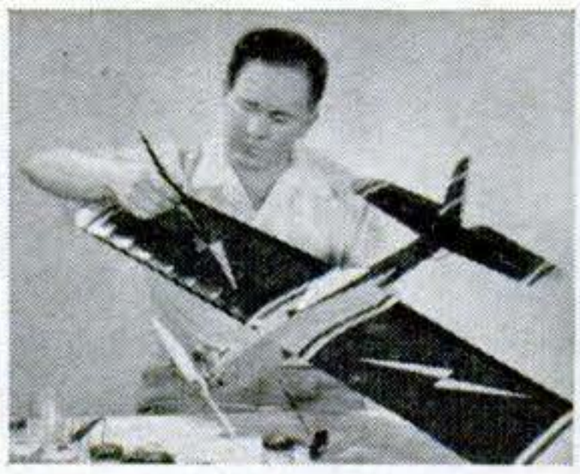
Automatic pair! The camera lens "squints" in the sun, opens in the shade, as your eyes do! You turn on the projector, *it* does the rest!

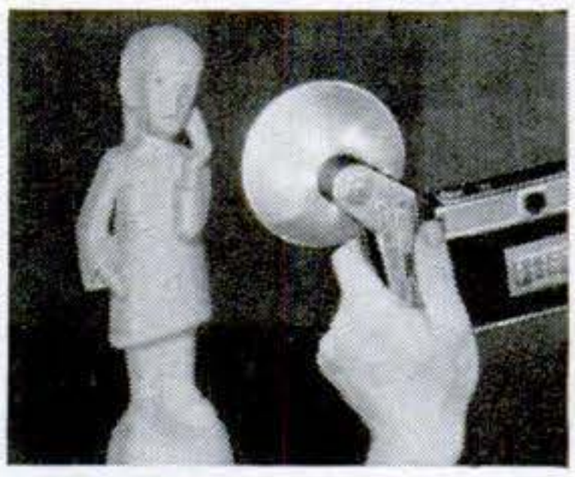
HOW THE KODAK AUTOMATIC 35 CAMERA HELPS YOU GET PICTURE-PERFECT

In sun, the electric eye makes the lens "squint" to a smaller aperture.

In shade, lens opens by itself to admit more light. Up to *f*/2.8 if needed.



Indoors, lens sets itself for available light. Signal tells you when to use flash.



With flash or for special effects, you can make lens settings manually.

EASTMAN KODAK COMPANY

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New Kodak team shoots and shows superb hobby pictures *automatically!*

THE CAMERA: New Kodak Automatic 35 with electric eye *automatically* sets the correct exposure!

THE PROJECTOR: The New Kodak Cavalcade changes slides *automatically* while you enjoy the show!

Wherever you are . . . whatever your subject . . . here's a team matched for the most satisfying hobby pictures ever. It lets you shoot and show them *automatically!*

Picture-perfect exposures. The Kodak Automatic 35 Camera frees you from exposure calculations—so you can concentrate on your subject. You can move from sunlight to shade, shoot indoors with room light or photofloods, yet never make a lens setting. The electric eye does that *for* you. It adjusts the lens to the light. It even signals you when to use flash. And all *automatically*, whether you are taking snapshots or color slides.

You can get extra-closeups. Shoot small subjects and hobby projects as near as 2½ feet! Finder allows for parallax.

You load fast. No threading. One thumb flick winds the film. And the fast *f*/2.8 lens means speed to spare, even in dim light.

Perfect picture shows. The new Kodak Cavalcade Projector, Model 520, changes up to 40 slides in succession—*automatically!* You set it just once for 4-, 8- or 16-second change intervals. Turn it on, and it does the rest. You never have to lift a finger.

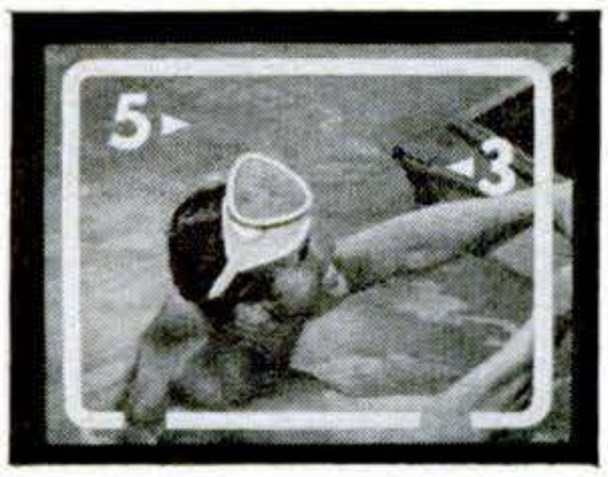
Your slides stay in focus from first to last because they're preconditioned by warm air. They're kept safe, too—each held in its own steel protector.

You can point out details on the screen with the shadow arrow. Edit as you show. Lift out any slide as you go. For a second look at slides already shown, or to skip ahead, just touch the control wheel.

And all the time, you and your guests enjoy beautiful slides shown at 500-watt brilliance *automatically!*

See this great automatic pair demonstrated at your Kodak dealer's. The Kodak Automatic 35 Camera is only $84.50, or as little as $8.50 down at many dealers'. The Cavalcade 520, only $124.50, or as little as $12.50 down. Hitch this team to *your* hobby. You're sure to enjoy it even more!

RESULTS EVERY TIME



Bright-frame finder shows framing allowance for 3 and 5 feet.

You focus as near as 2½ feet. Or even closer with Kodak Portra lenses.

HOW-TO PICTURES—

See your dealer for a copy of the 64-page Kodak book, "How-To-Do-It Pictures," 50 cents. And write our Sales Service Division for a free copy of the catalog "Kodak Books and Guides."

Kodak
TRADEMARK

(List prices, including Federal Tax, and subject to change without notice.)

Rochester 4, N. Y.

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Short Cuts and Tips

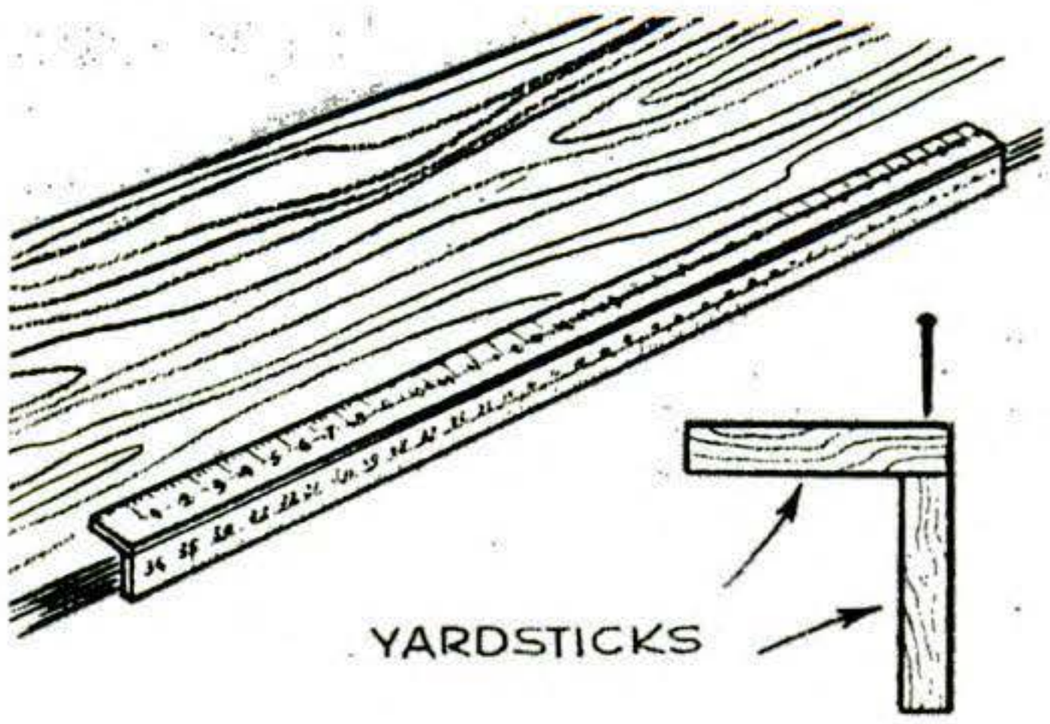
FROM PS READERS

Handy Desk for Lathe Users

THIS lathe desk is useful for keeping tool holders and wrenches in order, side by side with sketches and instruction sheets. It was made by routing recesses for each tool in a board. But jigsawed openings in a board fastened to a solid back would do as well. Legs of strap iron support the desk; a spring clip holds drawings.—*Hugh Lineback, Stillwater, Okla.*

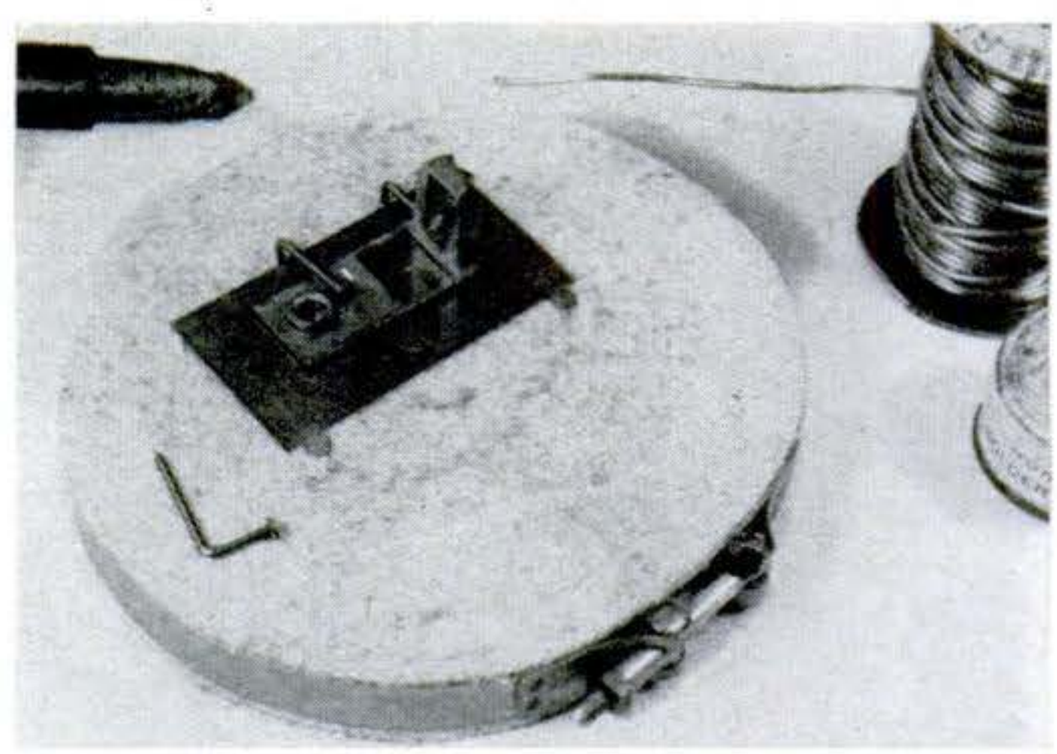
▶▶▶A PAPER match, soaked below its head with a drop or two of lubricating oil, supplies a good substitute for layout dye. Burn the match under the piece to be scribed; soot and condensation make a black, sticky deposit that can be easily rubbed over the work. Scribed lines and prick punch marks in the blackened surface are accurate and easy to see.—*Carl L. Beddig, Oakland, Cal.*

▶▶▶SURFACE finishes of highly polished metals, such as stainless steel or aluminum, must be protected during bending or forming operations. One of the best, and least expensive, methods is to paste a sheet of heavy kraft paper on the cleaned metal surface. After forming, remove the paper by soaking in hot water. Wallpaper paste is a good adhesive for this job.—*Federico Strasser, Santiago, Chile.*



Yardstick with an Angle

HOLDING a yardstick by one hand on the edge of a board can be simplified by attaching a second, and reversed, yardstick as shown. The angled stick may be slid easily along a board, with the double numerals permitting easy reading from either end.—*R. S. Henderson, Beloit, Wis.*



Pad for Soldering Small Parts

TIGHTLY rolled asbestos tape, held with a large hose or duct clamp, makes a good pad for soldering or brazing. In addition to protecting the bench top, the pad helps hold the work. Nails, bent at right angles, can be pushed into the pad to hold parts.—*H. J. Gerber, Stillwater, Okla.*

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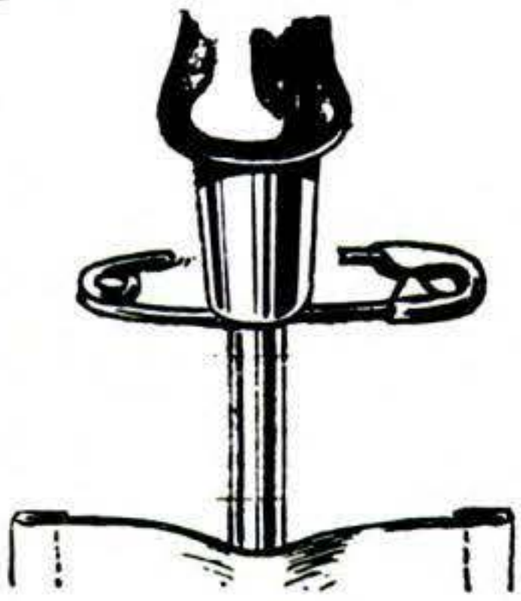
Electric Starter for Stubborn Scooter

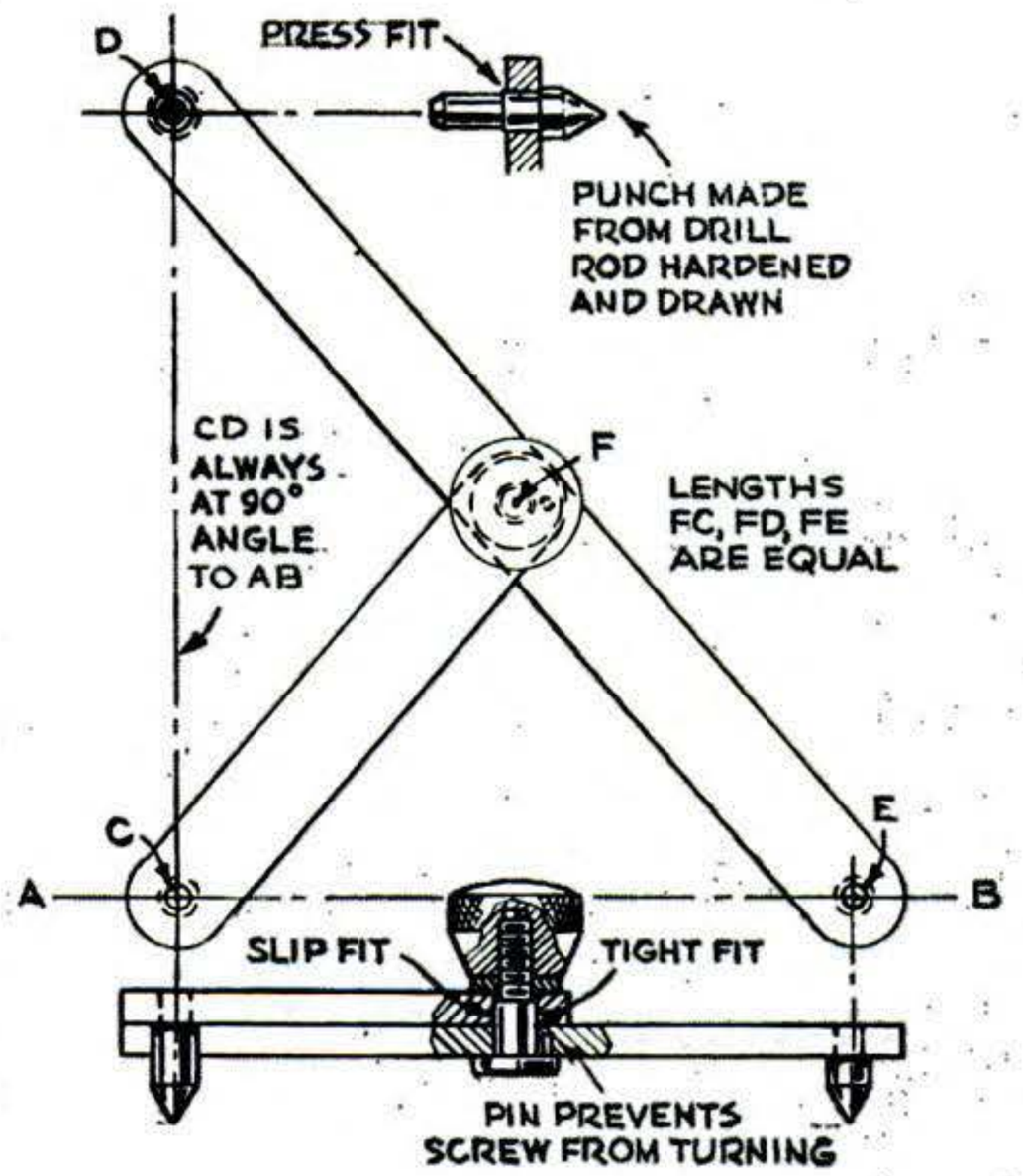
WHEN I had trouble starting my mail-carrying scooter during my daily six-hour trip, I decided to equip it with an electric starter. I used an old auto-starting motor, and belted it to the clutch. I have a sidecar for the mail and found space in it to hold the battery. The whole rig cost me only $20, including the battery. —*Raymon H. Gough, Geneva, Neb.*

▶▶▶A SMOOTH bend can be made in electrical conduit with a length of BX cable. Insert the cable in the conduit, then bend the tubing around a utility pole or other sturdy post. The BX keeps the conduit from collapsing, but is easy to remove after the bend is completed.—*Carl A. Kleppe, Milwaukee, Wis.*

Pocketing a Long Screwdriver

CARRYING a long screwdriver in a short rule pocket can be made easier by attaching a stout safety pin above the pocket. The loop of the pin supports the tool.—*G. H. Ellender, Lansing, Mich.*





Spinner Hurries Jackscrew

THE hand wheel of the jackscrew on the hay baler took two hands to operate and worked slowly. So Armin Garver of Boardman, Ohio, installed a ball-bearing steering-wheel spinner on it. Now he can raise or lower the jackscrew quickly, with one hand. —*John Krill, North Lima, Ohio.*

Layout Tool for Right Angles

THIS device uses fundamental geometric principles to lay out right angles or perpendiculars without fuss. Layout is more accurate than with dividers, and it can be used where a square won't work. In using the tool to erect a perpendicular to line AB from a punch mark at C, the point of the pin in the short link is placed in the punch mark at C. Placing one of the other pins anywhere on AB automatically sets the third pin on a line perpendicular to AB. A line drawn between marks at C and D will be perpendicular to line AB. The distance from C to E is immaterial.—*F. Murray, Chicago.*

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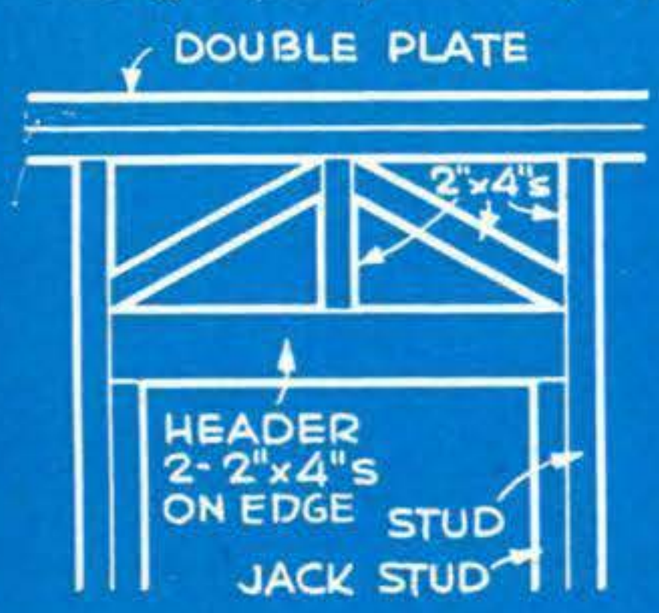
Amateur and pro alike will find valuable ideas here:

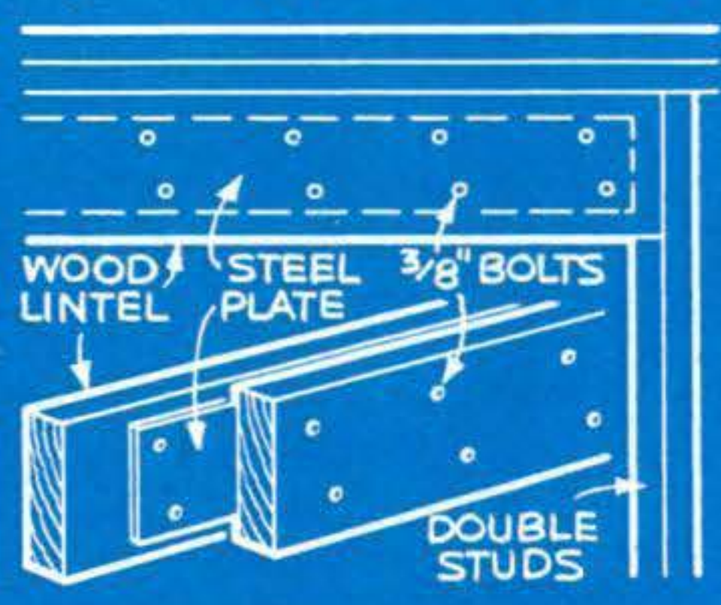
Building Tips for Everyone

By N. M. Pittman

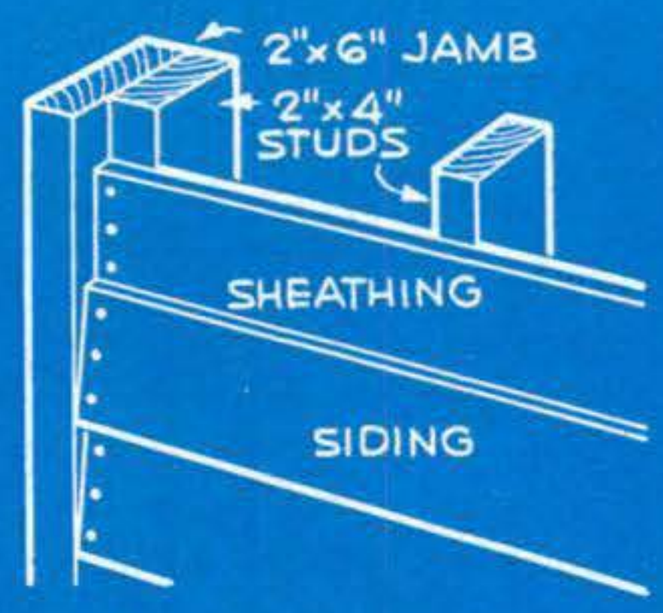
INSTEAD OF TRIMMING A DOOR OPENING, try this modern one-piece method. Have a two-by-six frame grooved for the wall-boards and rabbeted for the door stops. By using hardwood to match the door, the entire frame and door can be finished natural. The method gives a 30-percent saving over the jamb-and-casing method, and only one two-by-four supports the opening.



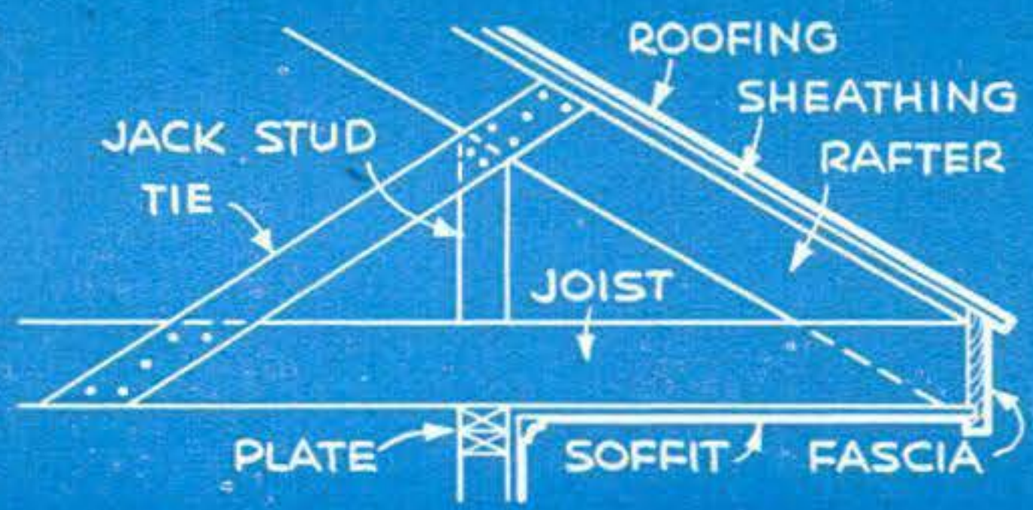
FOR A RIGID DOOR OPENING, install a double two-by-four header on end above the opening and support it by the jack studs. Reinforce the open space above the header with a vertical two-by-four additionally braced by two diagonal pieces cut with beveled ends. The engineering here is similar to floor bridging. It prevents wall cracks around the door, especially at corners.



A STEEL PLATE will brace wide openings and prevent sagging where an I-beam isn't specified. Install the steel plate between the wood lintels and tie the sandwich together with 3/8" bolts set flush with the wood so as not to interfere with nailing of the wall boards. The size of the headers and the thickness of the steel plate depend on the width of span and the structural load above it.



DOOR OPENINGS for garages or utility buildings that are unfinished inside can be framed quickly and at low cost by using a two-by-six nailed over a two-by-four. The combination makes an offset and weathertight corner for nailing on the sheathing and siding. Door-stop molding nailed to the inside surface of the two-by-six completes the job, except for hanging the door.



BY EXTENDING CEILING JOISTS out beyond the walls to support rafter ends, overhanging cornices as wide as 4' can be constructed flush with the interior ceiling instead of hanging awning-like over the wndows. Jack studs and diagonal ties brace the structure. The soffit panels are nailed to the cantilevered joists from below.

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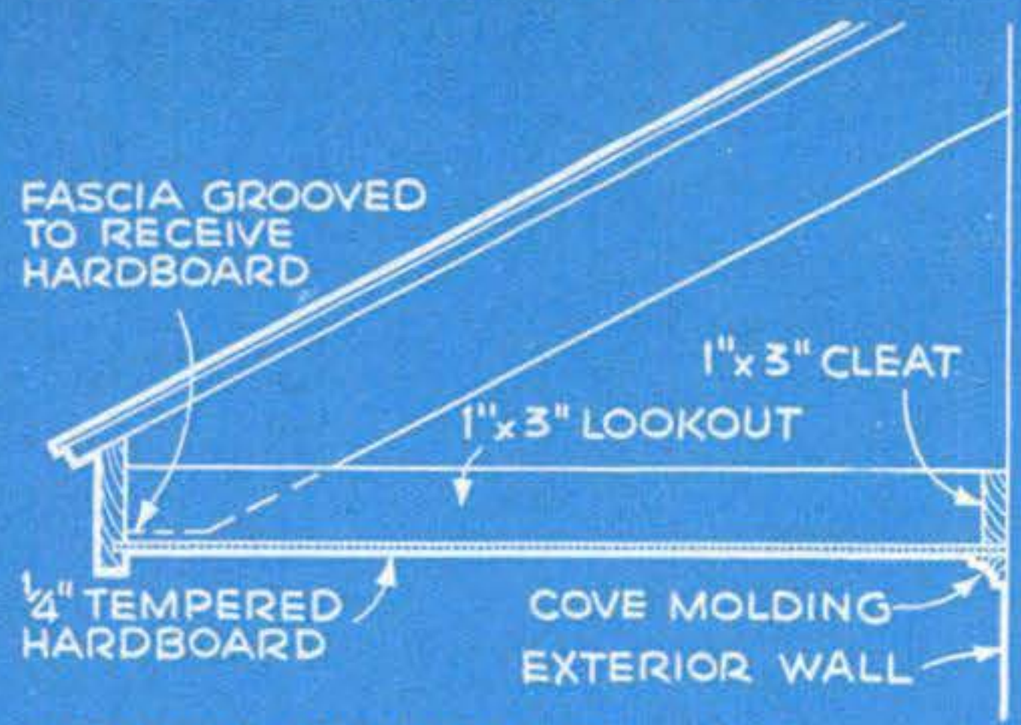
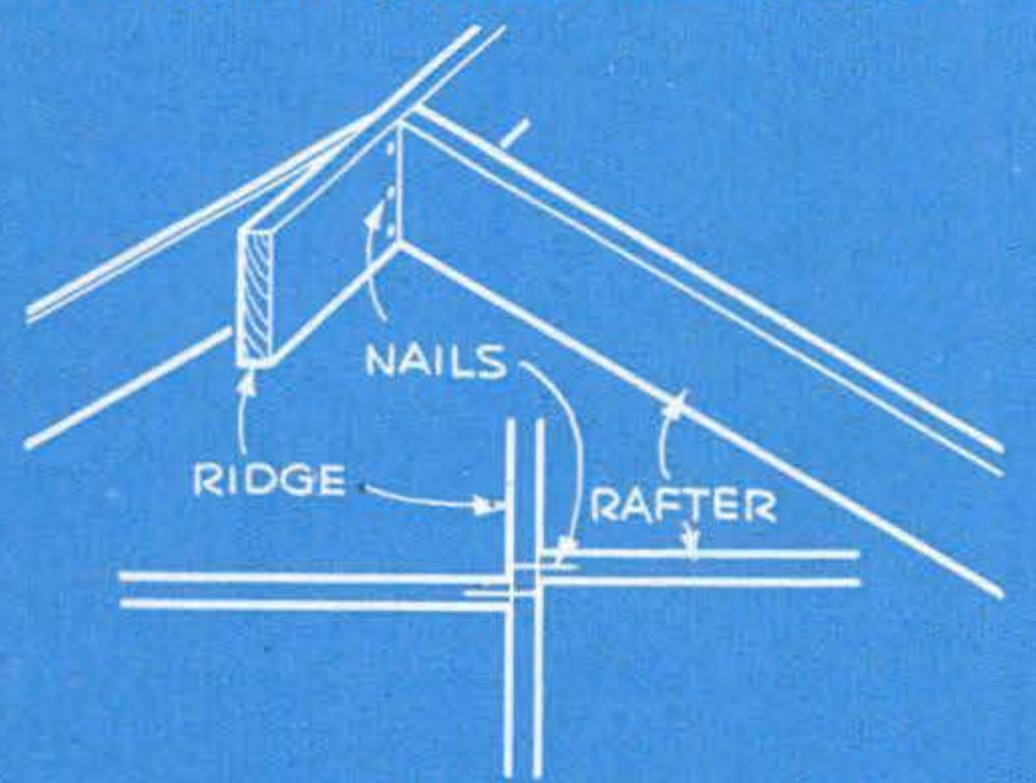
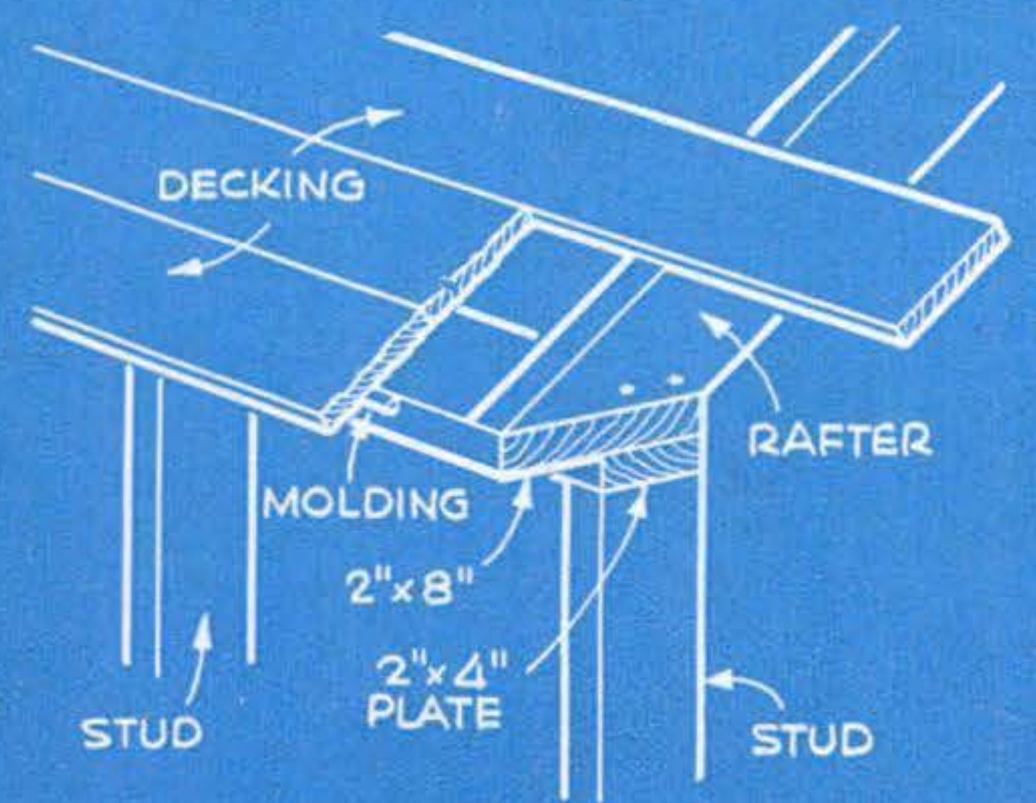


FRAMING OVERHANG: Cut a ¼" groove in fascia boards about 1" up from the bottom before you nail them to the rafter tails on an overhanging cornice. The ¼" soffit panels can quickly be inserted in the groove and nailed to a one-by-three cleat on the building. A cove molding conceals the nailheads.



FOR FAST, STRONG NAILING where rafters join at the ridge, offset them instead of placing them in line with each other. This way, nails can be driven through the ridge into the ends of all rafters without toenailing.



TO SAVE NOTCHING RAFTERS on a small building, cut their ends at an angle to rest on a two-by-eight nailed on the two-by-four plate. Toenail the rafters to the two-by-eight, apply decking, and trim with molding.

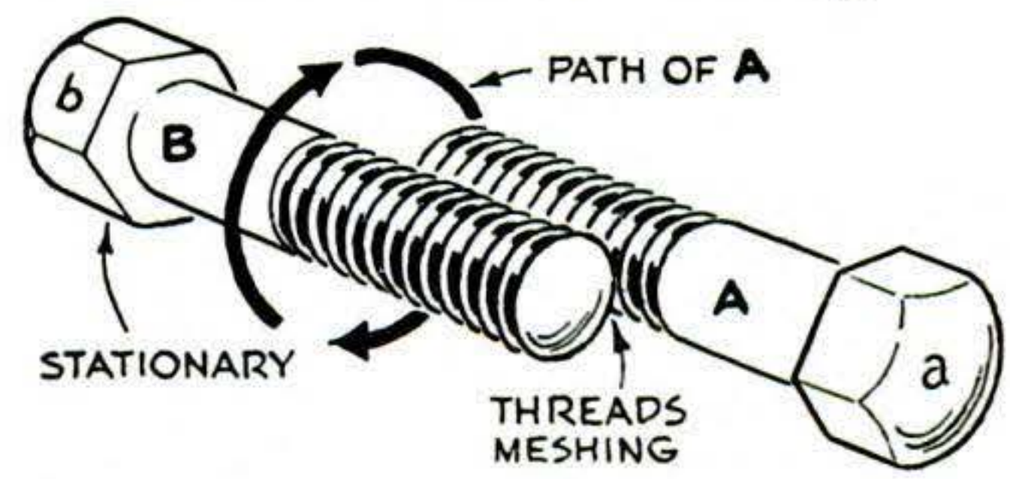
ВЕЗ ПОМОЩИ ЭКСПЕРИМЕНТА

Расстояние между головками болтов останется неизменным. Взаимное движение болтов в данном случае можно сравнить с движением человека, который поднимается по эскалатору с такой же скоростью, с какой лента эскалатора движется вниз.

Here's the RUSSIAN Answer to That Bolt Puzzle

ABOVE is the Russian solution to the bolt puzzle (see page 204). The translation: The distance between the bolt heads remains unchanged. The action of the bolts in the given case may be compared to the movement of a man who runs up an escalator at the same speed at which the tread is moving down.

But PS Would Put It This Way



THE escalator analogy ignores the key to the problem, which is that a clockwise movement of bolt **A** around **B** involves an equal but opposite, or counterclockwise, movement of **B** around **A**. Try it with your two forefingers.

Therefore, while **A** is traveling up the threads of **B** toward head **b**, bolt **B** is simultaneously moving down the threads on **A**, away from head **a**. As the thread pitches are identical, the heads remain a constant distance apart. Even if the motion of **A** around **B** be reversed, the action of the two threads would simply be interchanged. They would still cancel out.

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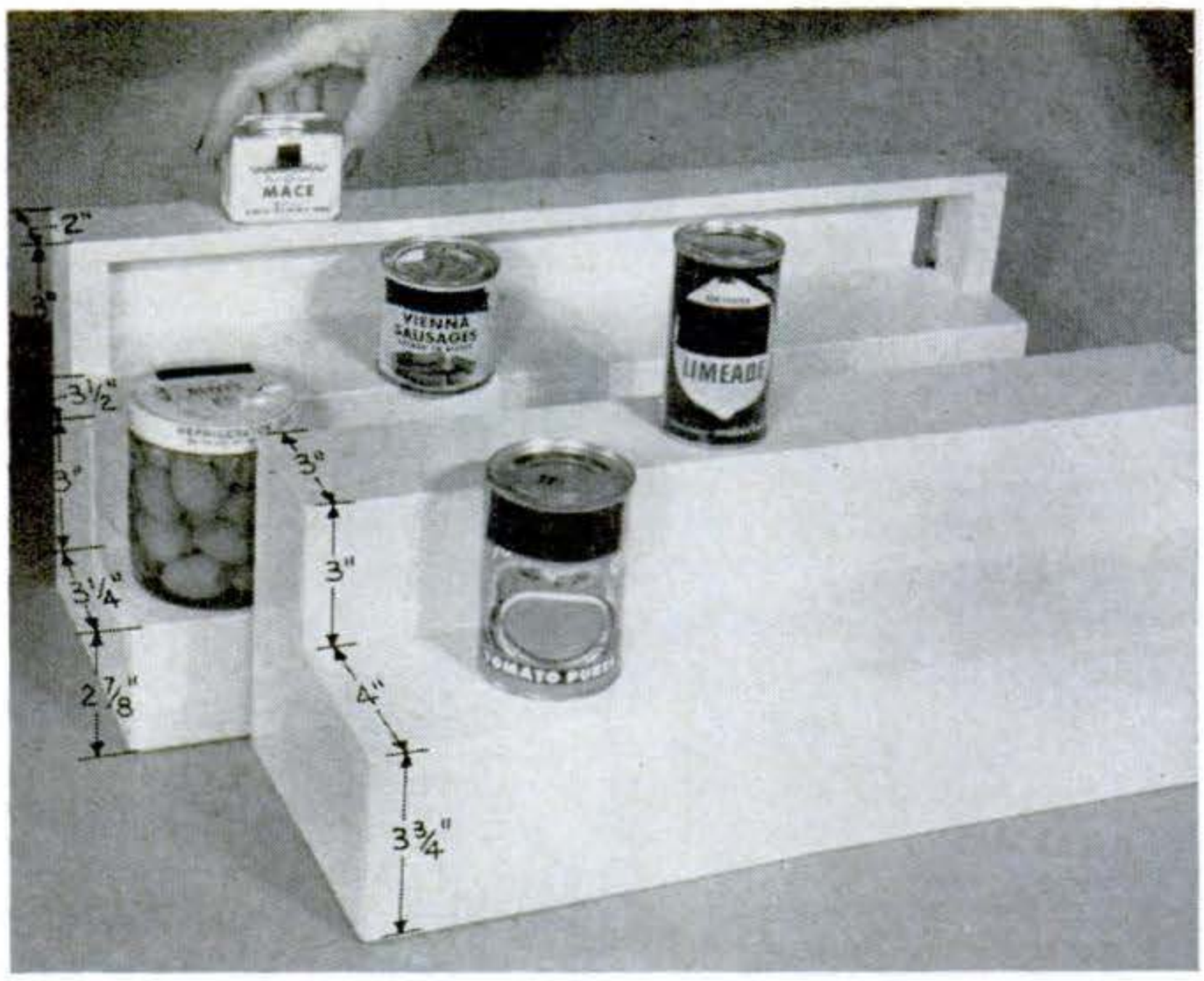
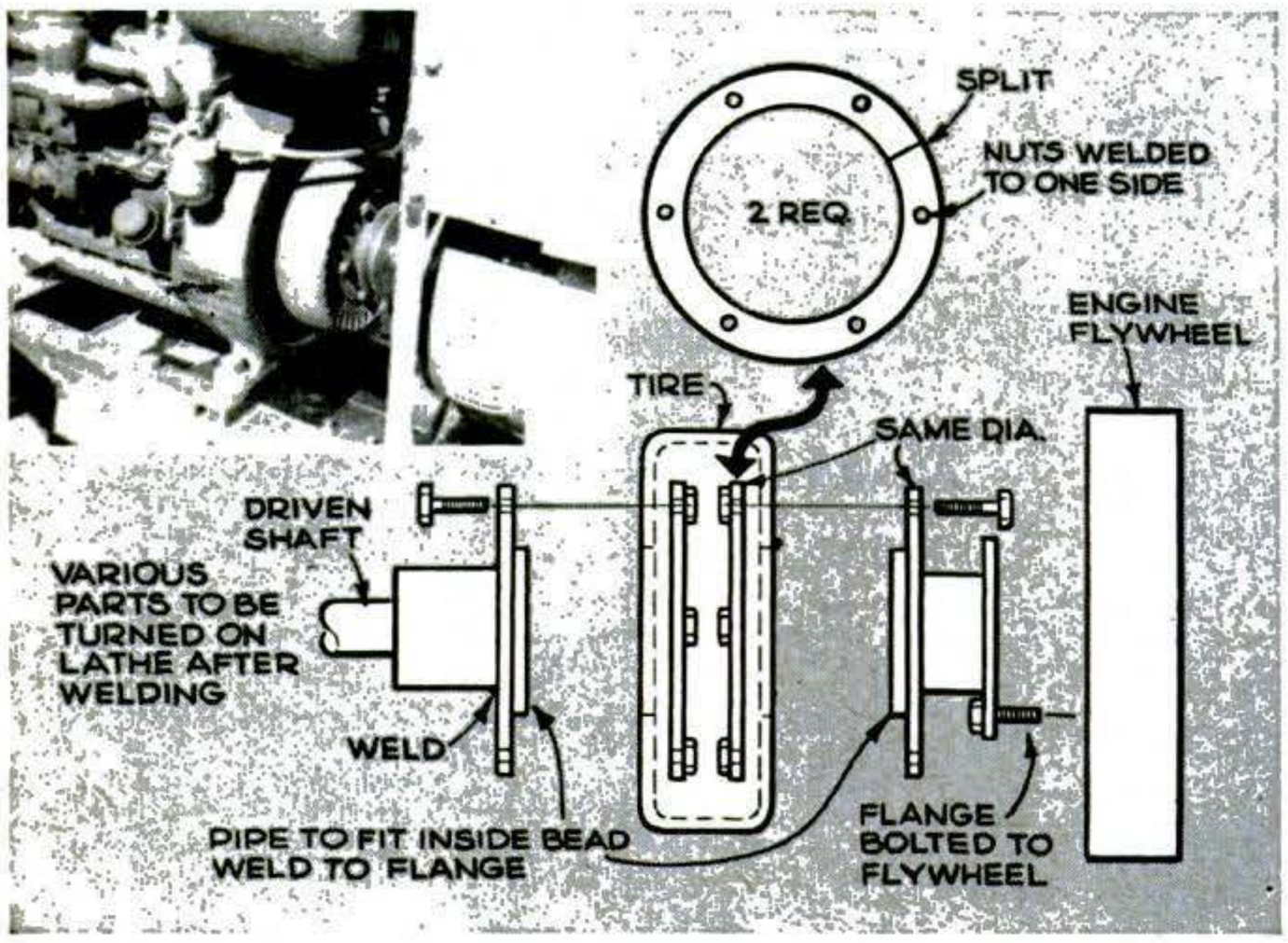
Short Cuts and Tips

FROM PS READERS

Bleacher Shelves for Crowded Cupboards



THESE tiered shelves expose each item to instant view and easy reach in a crowded cupboard. The sides were cut from 1″ stock, the tops from ½″ material, and the risers from ⅛″ hardboard. The overall depth should be about 3½″ less than the shelf to leave room for larger packages. Notches were cut to make room for shelf brackets. Dimensions are variable; those I used are given only as a guide.—*Thomas Williams, Springfield, Ill.*

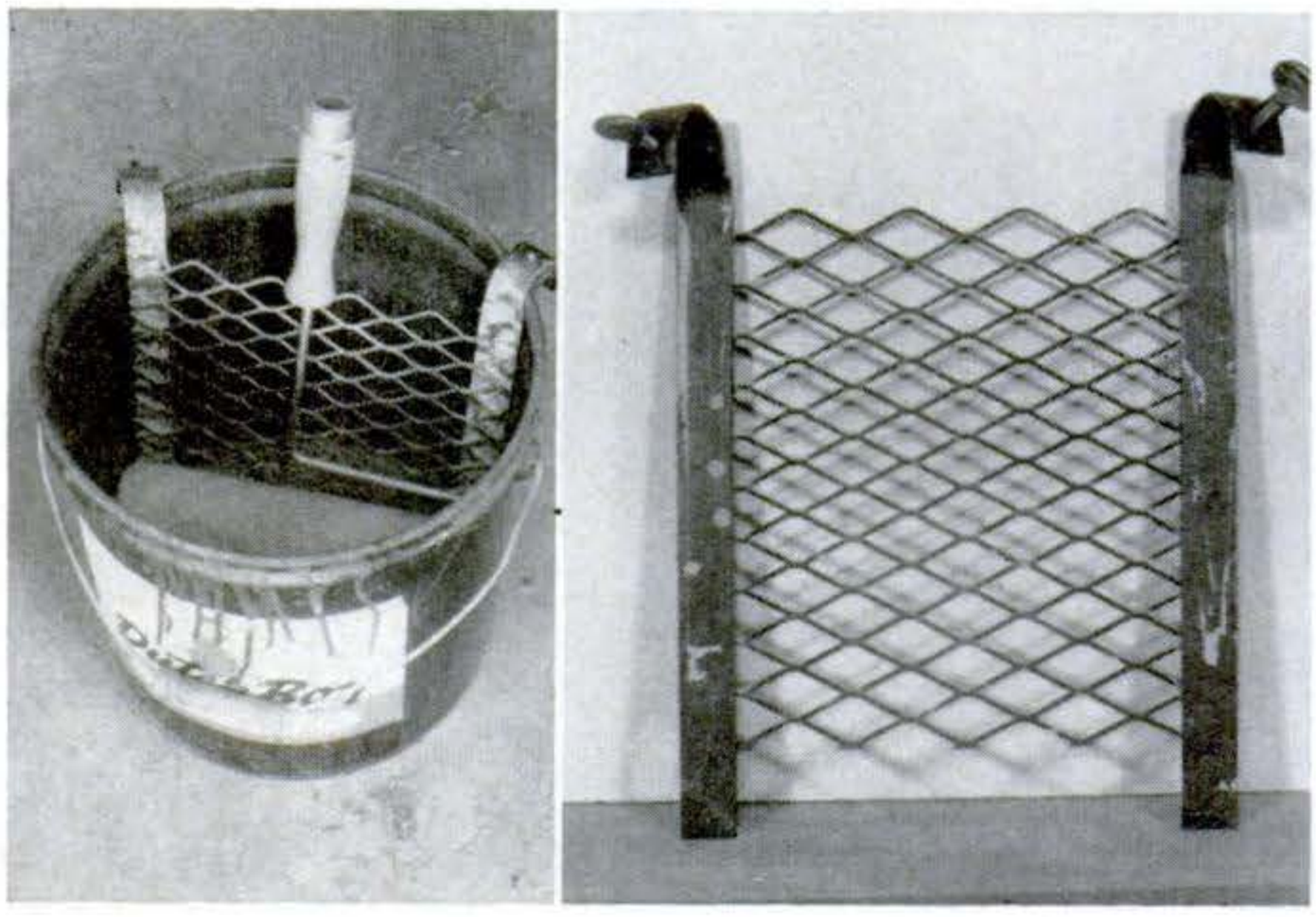


Flexible Coupling Made from Tire

THIS flexible coupling has been in use on my arc welder for six months and shows no sign of wear or deterioration. It's an old airplane tail-wheel tire with one side clamped to the engine flywheel, the other to the generator. The parts required welding and turning on a lathe; I split the flange rings to facilitate putting them inside the tire casing.—*Gene W. Taylor, Wolf Creek, Mont.*

Deep-Dish Rack for Paint Roller

UNLIKE the usual shallow paint-roller tray, this one is easy to carry and hard to spill. The vertical rack is a 10″-square piece of expanded metal brazed to inch-wide strap iron, cut to fit a five-gallon bucket. The strap is bent over the bucket rim, then drilled and tapped to accommodate thumbscrews. The rig holds a lot of paint for big jobs.—*Jay N. Corner, Ukiah, Cal.*



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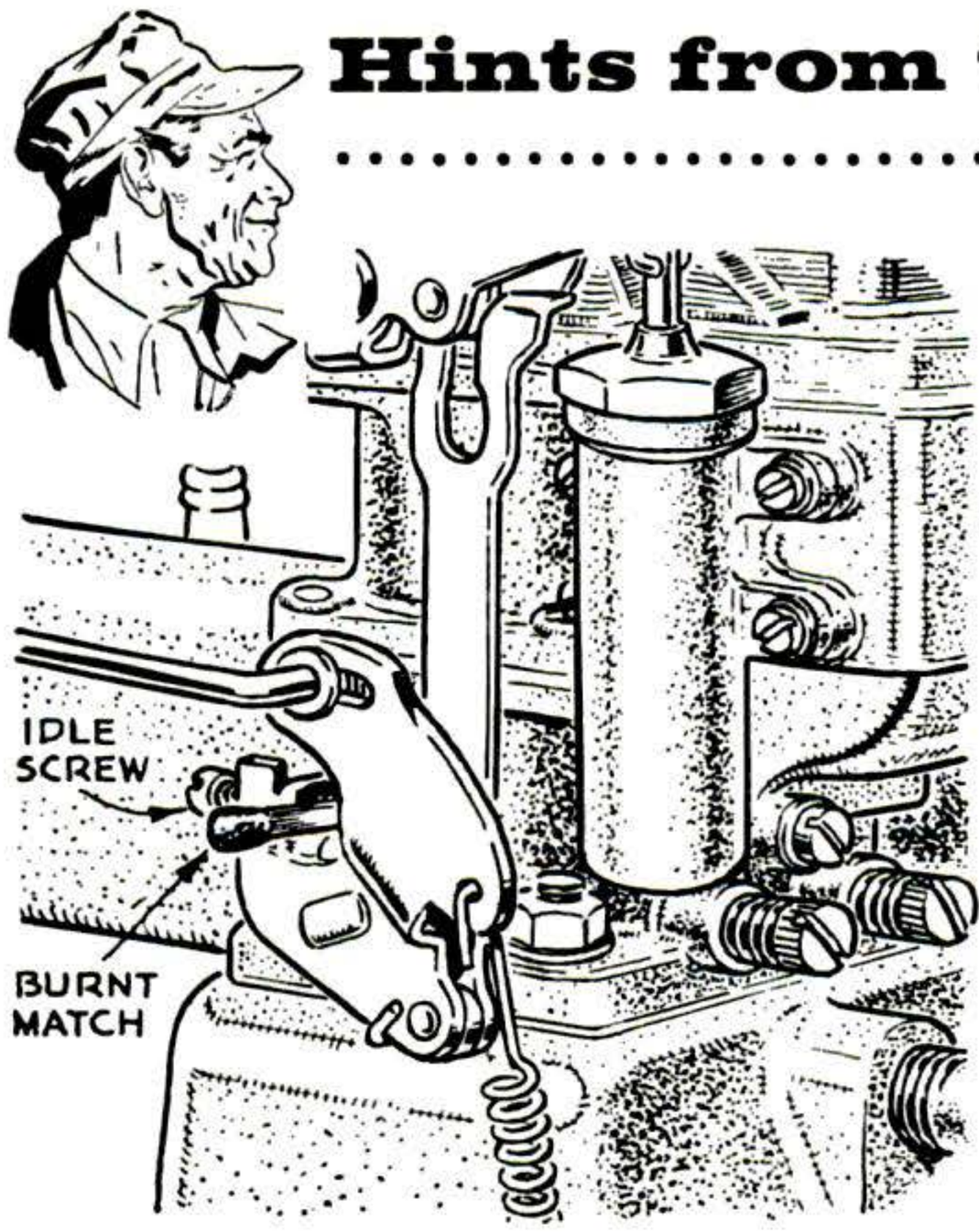
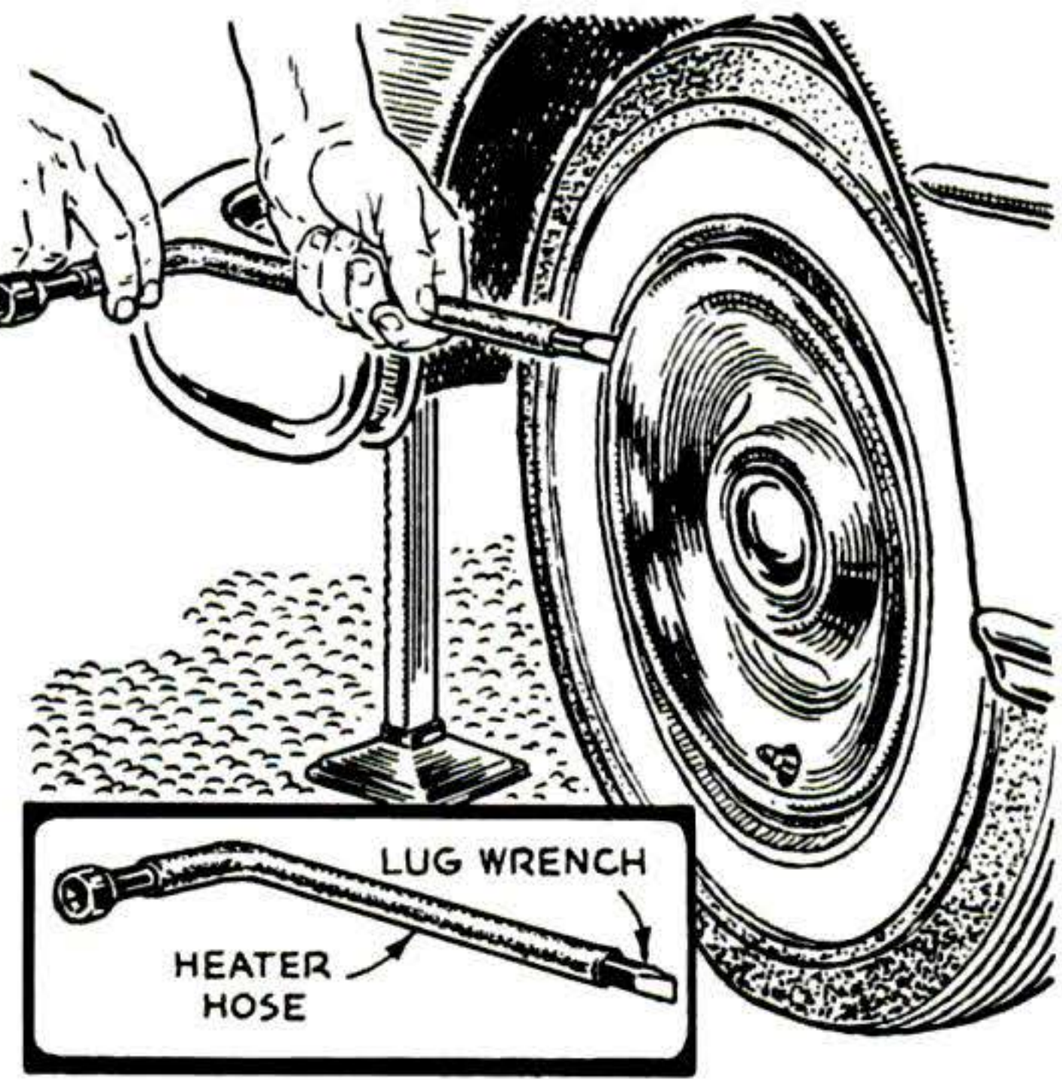
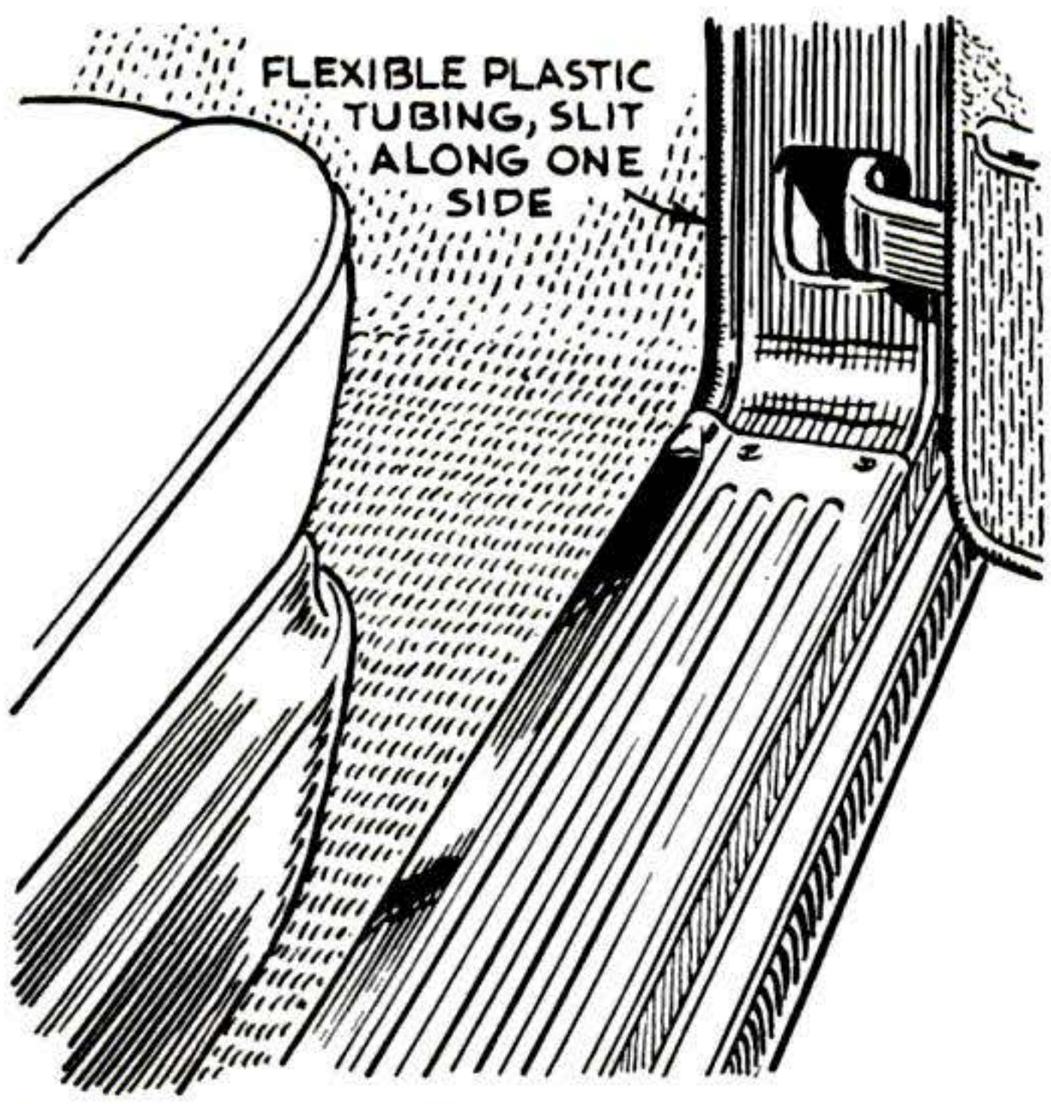
Hints from the Model Garage



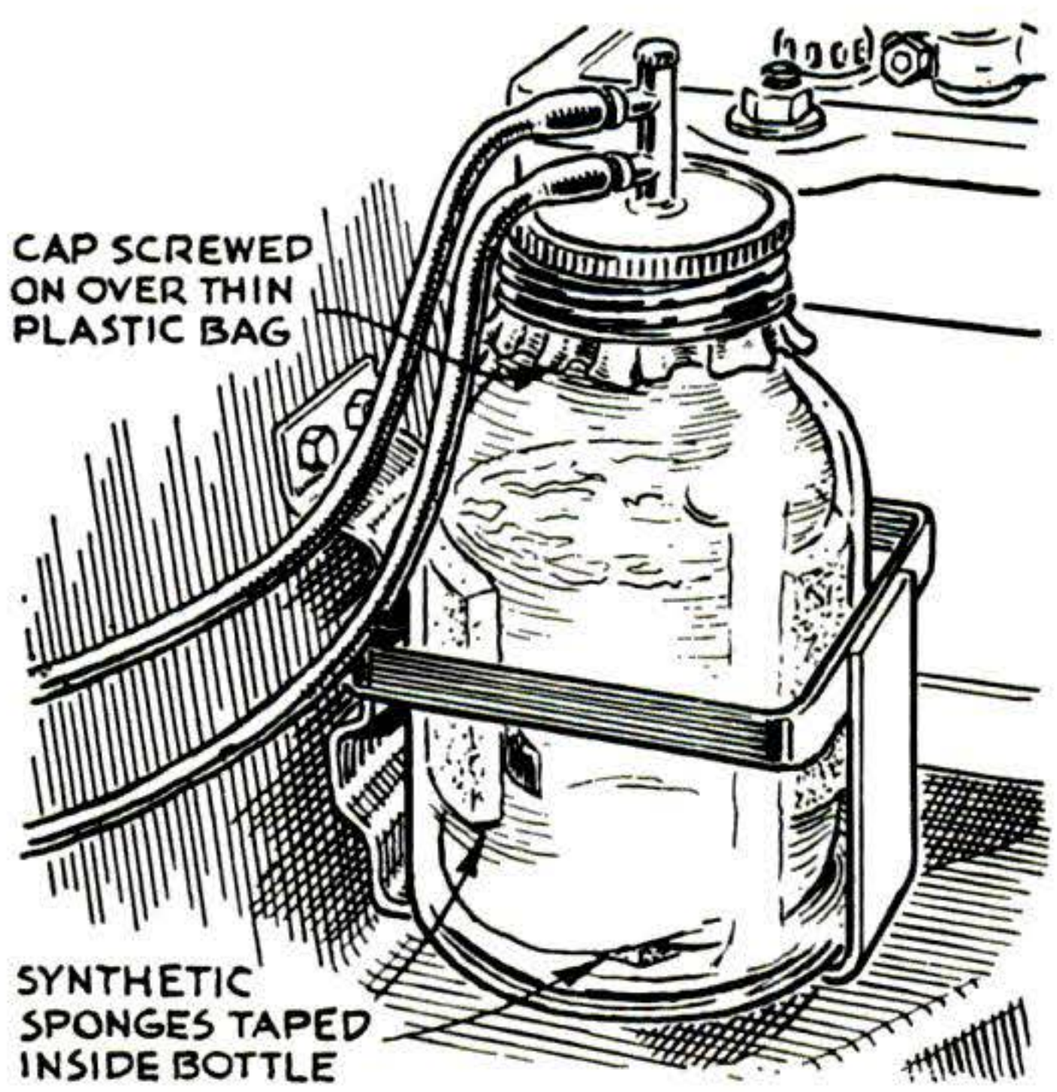
To increase idling speed temporarily when you charge the battery with the generator, or warm the engine, insert a burnt match between the carburetor idle screw and its stop. When you step on the throttle, the match will drop away.



Protect your hands from contact with chilled metal by slipping a length of heater hose over the shank of your lug wrench. The hose will also keep the wrench from marring rims or whitewalls when prying off wheel covers.



Frayed door piping can be improved in appearance, or the piping in a new car protected, by covering it with flexible clear-plastic tubing. Slit the tubing along one side and force it over the piping. Tuck the ends under the metal step plates.



Fool old man winter by placing several synthetic sponges and a plastic bag inside the windshield-washer bottle. Fill the bag with water and solvent. If the solution should freeze, the sponges and bag will allow for expansion.

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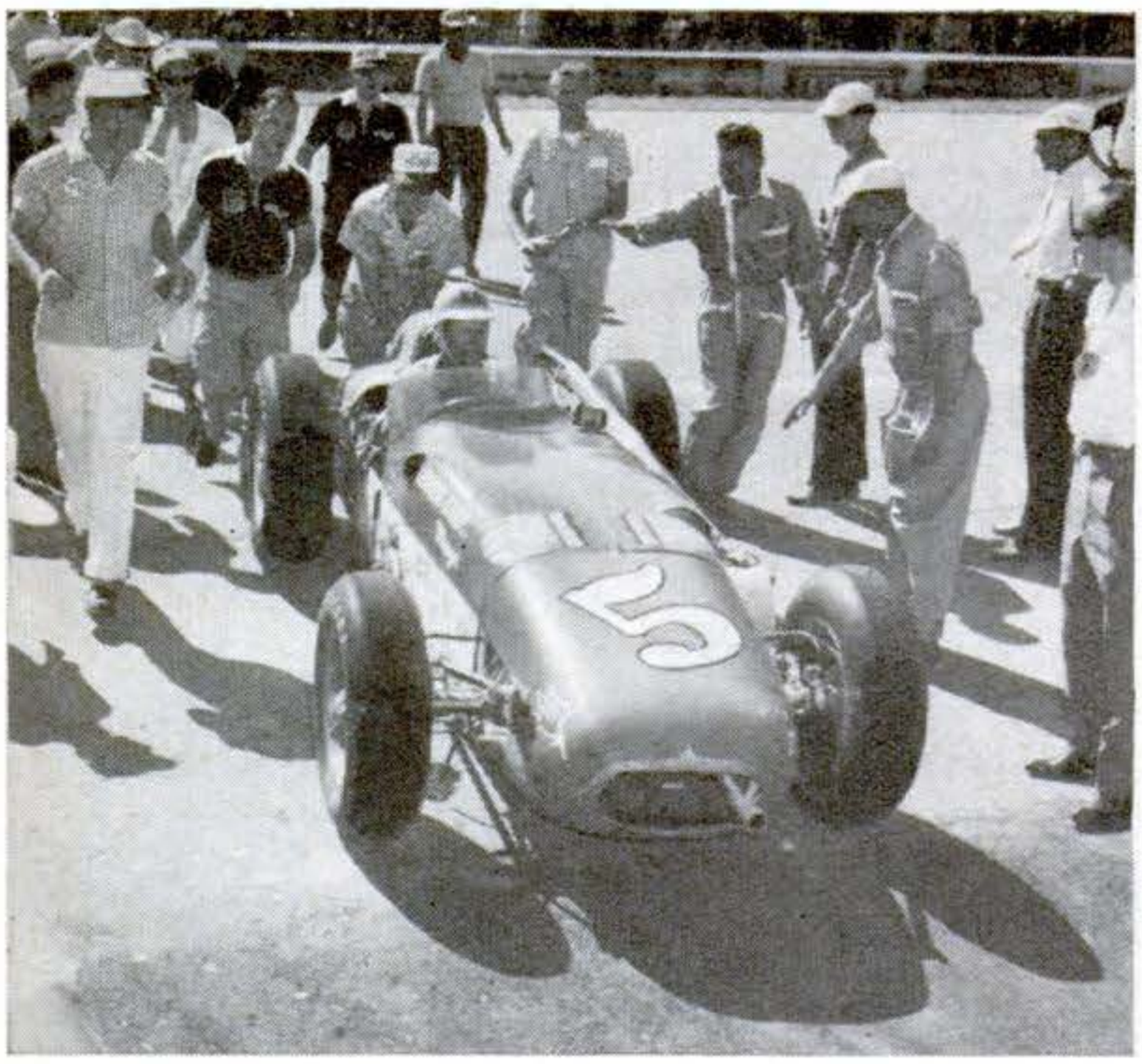
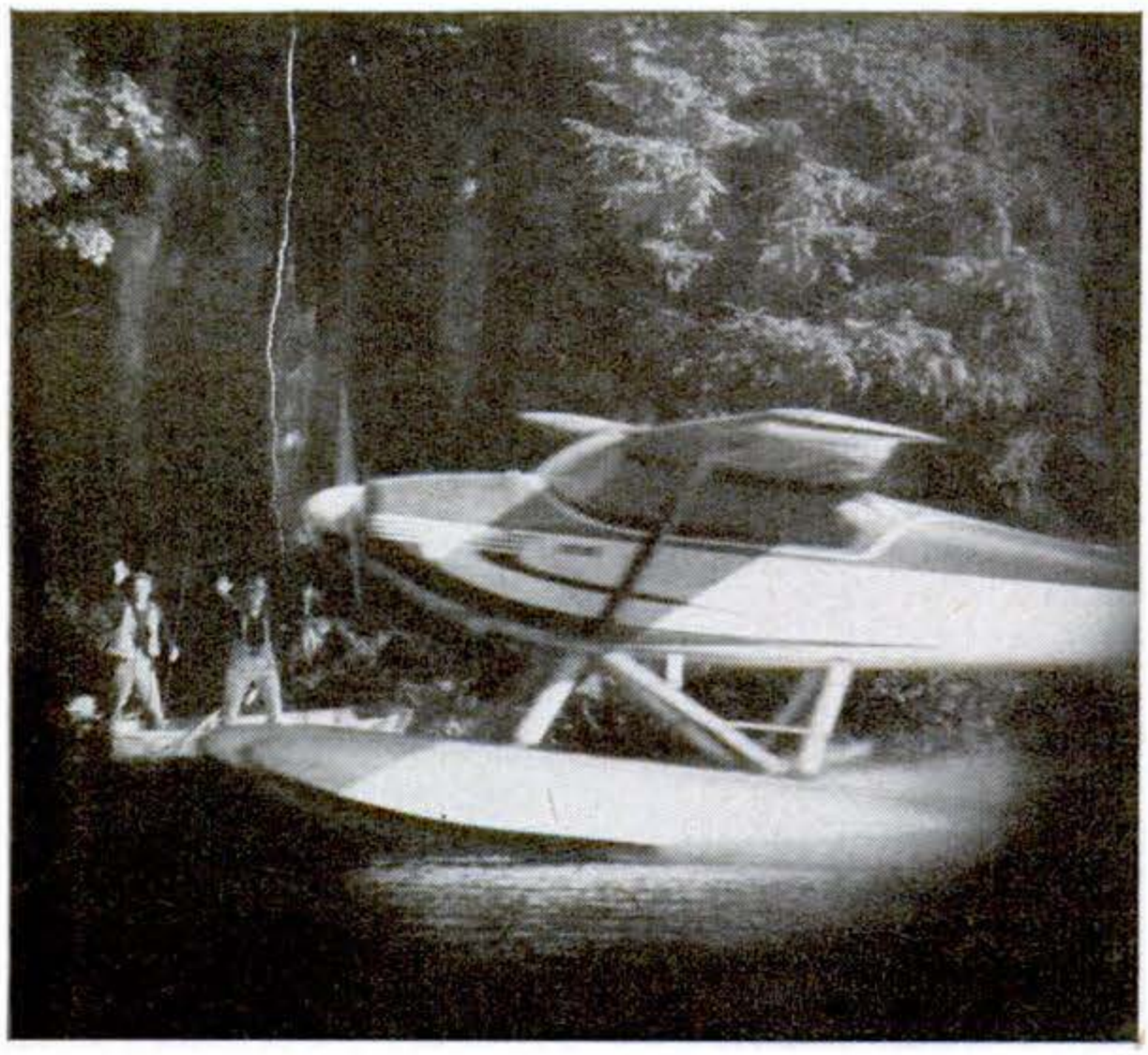


Racing cars—9 out of 10 winners . . . both "big car" and stock car, over the past 5 years, used Champions.

Car makers—over *twice* as many makes (includin Rolls-Royce) specify Champions—46 in all!



Aircraft—more aircraft (including over 90% of all airlines) use Champions than any other plug.

Trucks—17 out of 21 U. S. makers specify Champio spark plugs for *full power*, regardless of load or road.

Q. Why is it that wherever performance is vital—on land, sea or in the air—the experts choose Champion spark plugs?

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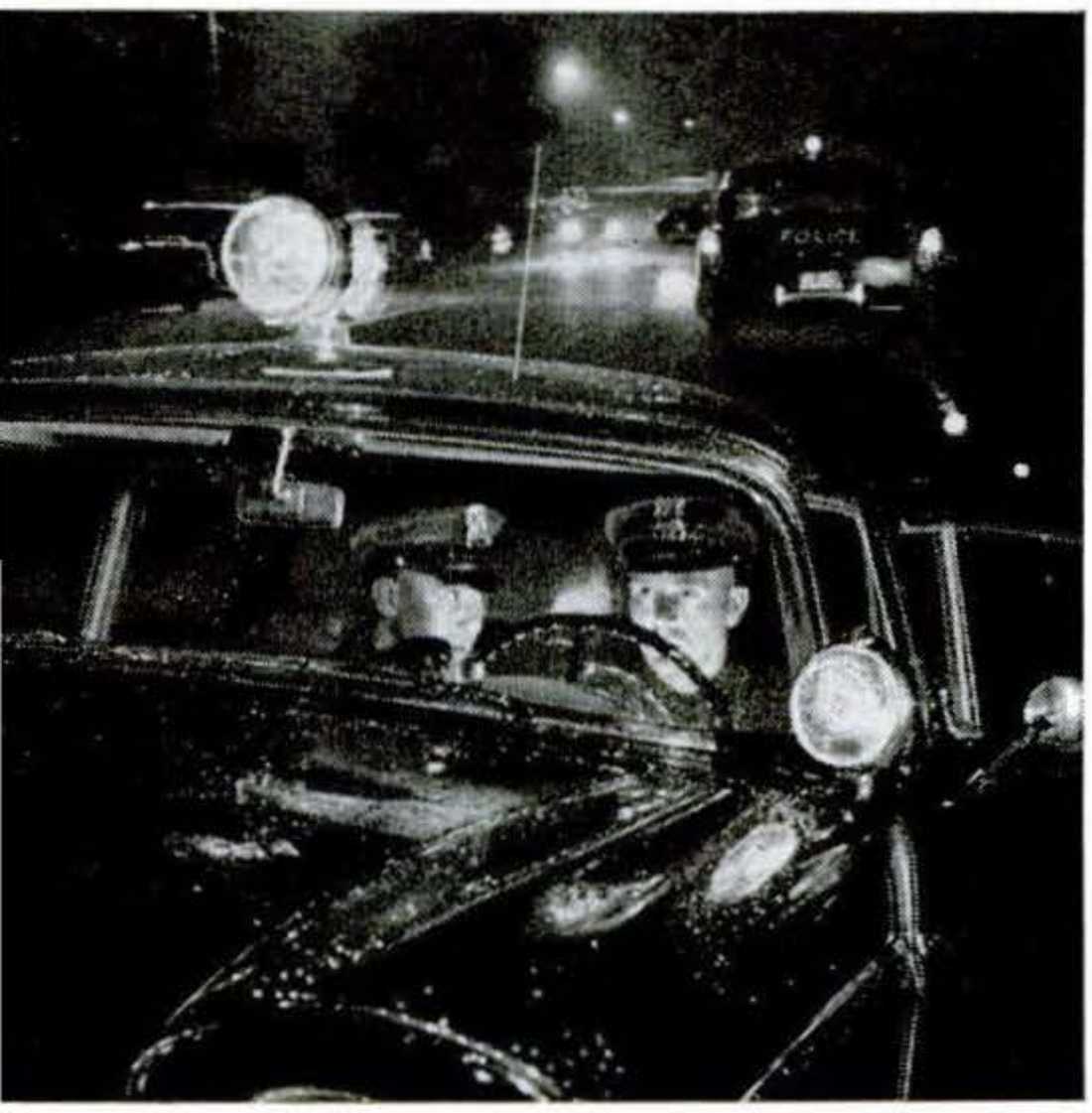
Marine engines—9 out of 10 power boat winners —*all* U. S. outboard engine makers—use Champions.

Fire engines—*all* major makers use Champions for sure starts and *complete* dependability.



Police cars—nearly *twice* as many U. S. police cars are powered by Champions as by any other plug.

Farm tractors—every major U. S. maker specifies Champions for the dependable power farmers need.

A. The experts know from experience that you can always depend on Champions. To get top performance from your car, put in a new set of Champions every 10,000 miles!

CHAMPION

World's favorite spark plug —engineered for every car built by Ford Motor Co., General Motors, Chrysler, American Motors, Studebaker-Packard and every major foreign maker.

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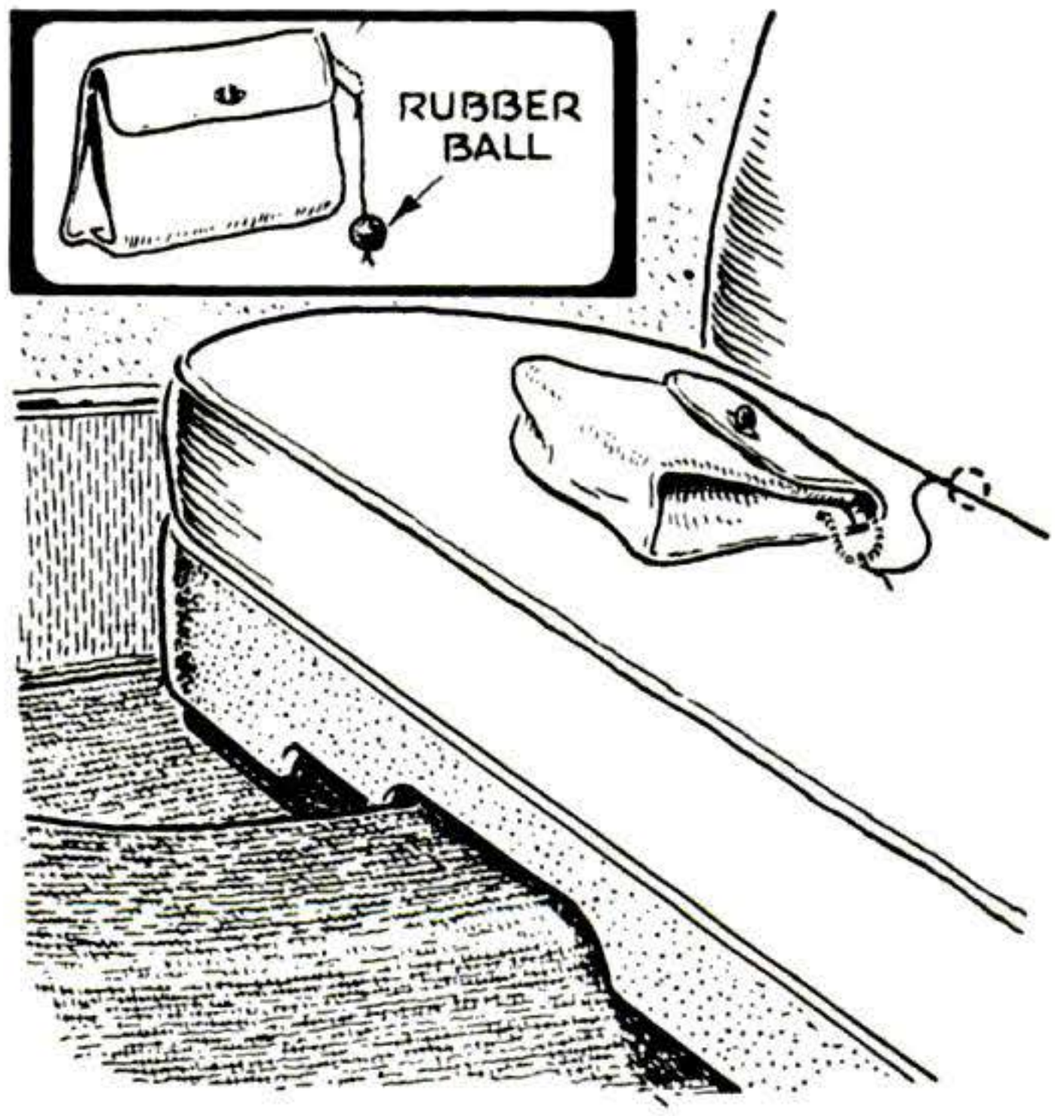
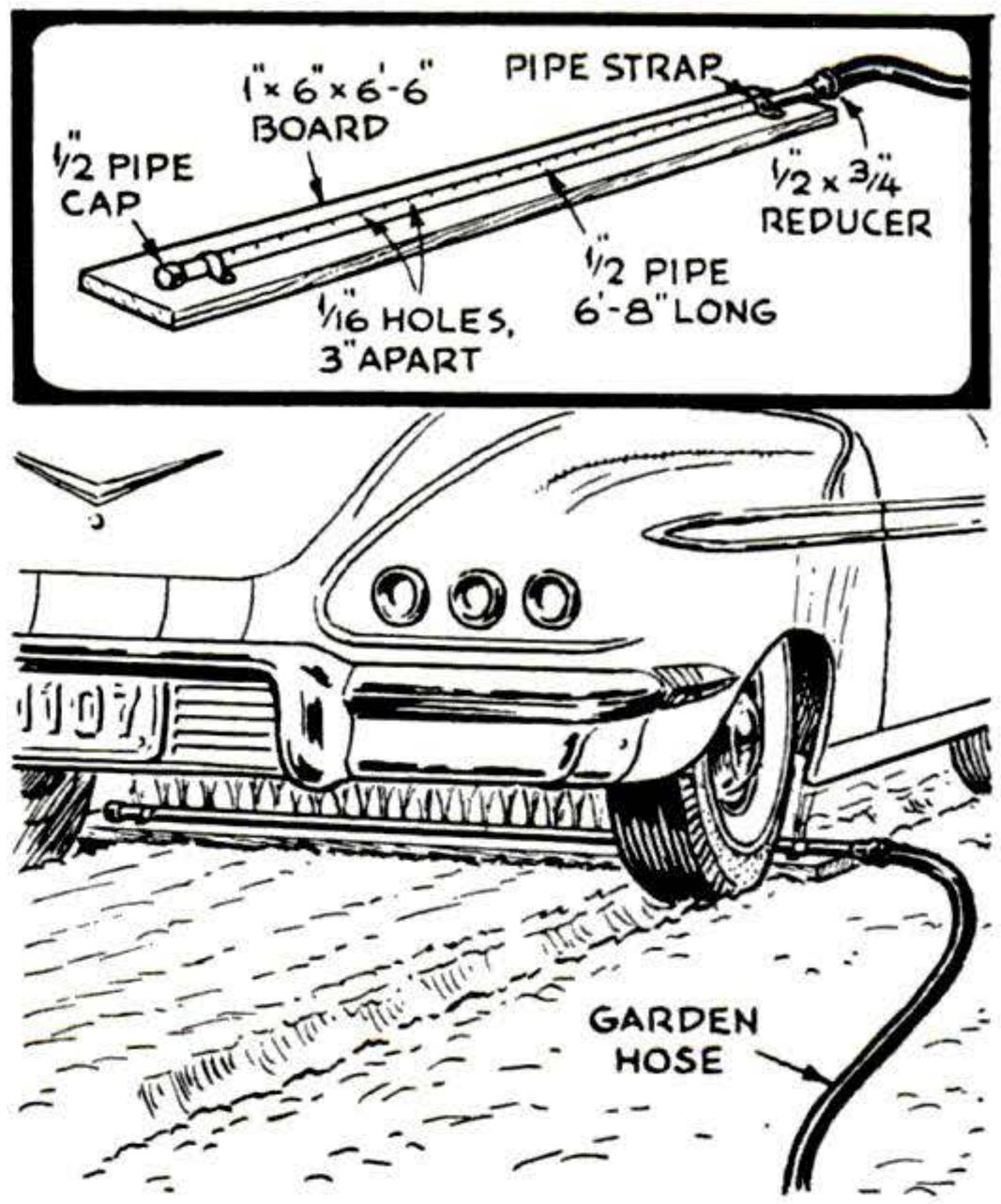
More Hints from the Model Garage



Tether a purse, briefcase or deliveryman's route book to a small sponge-rubber ball, and it won't slide off the seat. Tuck the ball between seat cushion and backrest to anchor it. The ball can be dropped into the purse or briefcase when not in use.



Roads salted in winter? This under-car spray rig will flush away salt deposits as you slowly drive the car into the garage. Place the rig across the driveway and connect it to the garden hose. Drain the hose after using so it doesn't freeze.

Light scratches on a windshield can be polished out without affecting visibility, but removal of a deep scratch might cause distortion in the glass. If the deep scratch is in the line of vision, it had best be left alone or the glass replaced. To remove light scratches, proceed as above. A polishing kit—part No. 987,502—can be obtained from Pontiac parts dealers. It contains an abrasive called Glass-Nu and a felt wheel for applying the compound and buffing out scratches.

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WHAT YOU SHOULD KNOW ABOUT GASOLINE ADDITIVES

Your fuel system has been precision-designed and engineered to help your engine deliver maximum performance and economy. And gasoline tank additives can help you maintain these desired results, no matter what make of car or truck you drive.

Normal driving causes deposits of carbon, gum and sludge to accumulate in your fuel system. Even when the system is in perfect adjustment, these deposits will cut down on your performance and economy. And, unless these deposits are removed, it is impossible to effectively adjust or tune your engine.

The proper gasoline additive will clean your fuel system and keep your performance alive. And regular use of an additive will help provide you with consistently good performance.

Since many additives leave deposits of their own, and others do only a partial job, the world's largest manufacturer of original equipment carburetors has researched and tested a new additive, CARBON-X 77.

BY THE MAKERS OF AMERICA'S NUMBER ONE ORIGINAL EQUIPMENT CARBURETORS

CARBON-X 77 is the *complete* fuel system conditioner. It dissipates the formation of natural gums in gasoline, allowing the fuel to pass through carburetion and combustion without forming gum deposits in the tank, lines, fuel pump or carburetor. It resists the formation of coke and carbon in the intake manifold and combustion chamber, and protects the entire system from acidic corrosion. And CARBON-X 77 keeps gas lines free from ice formation and eliminates carburetor icing.

Next time you get gas, ask for CARBON-X 77. You'll notice the difference on your first trial can. CARBON-X 77 is recommended by the makers of America's number one original equipment carburetors. Rochester Products Division of General Motors, Rochester, New York.

If automotive service is your business, ask your nearby UMS distributor about CARBON-X 77, the *complete* fuel system conditioner, *plus* the rest of the fast-moving Rochester-GM Carburetor Service Line . . . Carb-AIRator, the CARBON-X chemical line and factory-recommended carburetor replacement units and kits.

GM
GENERAL MOTORS

America's number one original equipment carburetors

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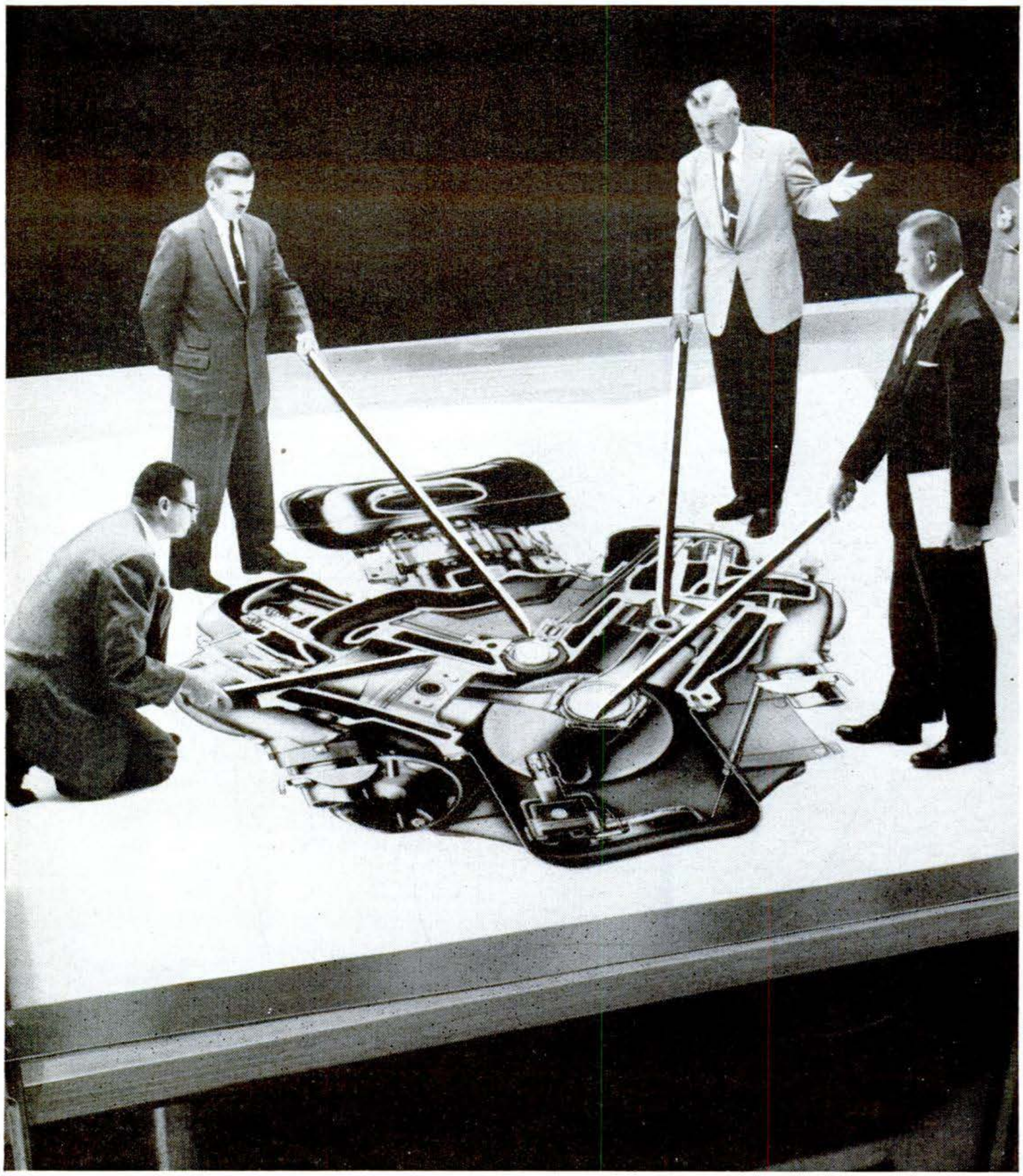
Today's close tolerances



For the finest protection money can buy... AC

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leave no tolerance for dirt!

That's why AC has developed the new Triple-Trapper principle of filtration — protecting critical engine areas where lubrication must not fail!

The job of an oil filter is to remove every contaminant or foreign substance such as dirt, grit, metallic bits and carbon so they won't wear away or scar finely finished surfaces. Finely drilled oil passages must not be clogged by any impurity. For example:

In many engines you will find an hydraulic valve lifter between the camshaft and the push rod that actuates the rocker arm and valves. This key component keeps "play" or looseness out of the valve train and thus makes for quiet, efficient, split-second valving. The lifter has needle-fine valving itself which admits the oil so necessary for hydraulic operation. A tiny bit of metal or dirt could clog the opening and give you trouble. As long as an AC Triple-Trapper Oil Filter is on the job — and is changed regularly — such troubles are practically eliminated. AC conducts 96 reliability tests on its oil filters during manufacture to insure highest quality!

AC TRIPLE-TRAPPER Oil Filter

Now you can have the powerful Triple-Trapping action devised by AC Engineers

TRAP NO. 1 is the filtering element itself, a resin-impregnated material that traps particles as small as 1/15 the diameter of a human hair.

TRAP NO. 2 is the amount of filtering area. The AC filter has more *usable* area . . . or surface. Oil, passing through the filter, is spread out and slowed down over this greater area. Thus, the filter has a chance to catch fine particles. The trapped particles themselves form a filter "bed" on top of the filter element. This helps trap even finer particles.

TRAP NO. 3 is the design of the filter element, a unique arrangement of folds that provides maximum filtering area, hence maximum filtering capacity. Because of this greater capacity, the filter is able to hold *more* particles.

SOLD BY 283,000 RETAILERS

AC SPARK PLUG THE ELECTRONICS DIVISION OF GENERAL MOTORS

TRIPLE-TRAPPER Oil Filter used on more new cars than any other brand

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Gus held out the list. "Looks like we're both in a jam, Howie. I need these parts bad."

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Gus Pulls a Switch

By Martin Bunn

WITH a bowl of beef stew, apple pie a la mode, and two cups of coffee under his belt, Gus Wilson walked leisurely back to the Model Garage. His young assistant, Stan Hicks, was sitting at the workbench dropping banana peels into his empty lunch box.

"You got a one-track mind, Gus?" Stan asked, taking half a banana in one bite.

"On that, Stan, I plead the Fifth Amendment. But why?"

"Howie Stone. He stopped by to cry on my shoulder about all auto mechanics having one-track minds."

Gus leaned over and adjusted a wrench hanging askew on the tool board. "So that used station wagon of his is still acting up. Were you able to fix it?"

"I didn't even get a chance to look at it," Stan said. "When I told him that the symptoms he described sounded like a faulty fuel pump he blew his top and drove off. And the way his car sputtered and balked, it sure sounded as if it was starved for gas."

"Howie's a nice boy," Gus said, "but stubborn, like all the Stones. Guess he just made up his mind it's not the fuel pump, and that's that."

"Wish we could help him," Stan said. "He spent all his money on that wagon, got his package-delivery service started—and now he can't deliver."

Gus nodded. "I know. P. J. Bassett told me about it over at the diner."

"You mean Howie's going to lose the job of hauling Pete Bassett's express shipments to the railroad station?"

"Looks like he's lost it," Gus said. "He missed two trains last week. And Pete's maple-sugar candy got off to the customers a day late."

The telephone rang in the Model Garage office. Gus answered it, did more listening than talking, and came back into the shop. "That was Pete Bassett. He's staying late making up a big order that must make the evening train."

"Gosh, Gus, and Howie probably won't be able to make it."

"Pete didn't want Howie. He wants me to come over and get his old pickup running. He hopes to use it to start making his own deliveries again until he can get a new truck."

"Maybe we could stall," Stan suggested. "Maybe we can somehow get Howie to bring his wagon in here and let you check it over."

Gus grinned broadly. "Maybe we can, Stan, maybe we can—if you're willing to aid and abet."

Stan looked at his boss eagerly. "Skulduggery?"

"Not quite that bad, but maybe a few white lies."

"Count me in," Stan said. "What do I do first?"

"Check the bins and make out a list of stock parts we need while I make a phone call."

Stan looked puzzled, shrugged his shoulders and went to work.

HALF an hour later Stan walked back into the office and handed Gus an order list and carbon.

"Want me to run over to Milltown for these? Nice day for a drive."

"Sorry to disappoint you, Stan, but I've just put in a call for your pal Howie Stone."

CONTINUED

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"Oh, no, Gus. With his wagon running the way it is, Howie'll never make those hills on the 10 miles to Milltown and back."

An engine sputtered to a stop outside. "Here's Howie now." Gus gave his assistant a shove. "Get back in there and keep out of sight."

Stan pulled his cap lower over his eyes. "The plot thickens," he said, slinking dramatically off toward the rear of the garage.

OUTSIDE Gus greeted Howie with an innocent smile. "Glad you got my message about that pickup in Milltown. It's a rush job."

Howie's smile wasn't as cheerful. "Gee, Mr. Wilson, I'm afraid I'll have to turn you down."

"You're in the package-delivery business, aren't you?"

"Well, I thought I was until this station wagon of mine started acting up. I can limp around town okay, but once I get on a hill . . ."

"What seems to be wrong?" Gus asked.

"I don't know—yet. I've wanted to ask your help, Mr. Wilson, but after I refused your offer to check the bus before I bought it—well, I've been sort of embarrassed."

"But you've seen other mechanics?"

Howie nodded, keeping his eyes down, and shuffling his feet. "That's right—and they all seem to have one-track minds. Fuel pump, fuel pump, fuel pump—that's all I hear. Why, one fellow even wanted to charge me 100 bucks to tear down the engine—just to put in a new fuel pump."

"Maybe it *is* your fuel pump," Gus said.

"Shucks, no, Mr. Wilson. I put a new one in myself, and it didn't make a bit of difference."

Gus held out the parts list. "Looks like we're both in a jam, Howie. I need these parts bad."

"I'd like to help, but . . ."

"Let's help each other," Gus broke in. "You take my truck and drive over to Milltown and pick up these parts. I'll phone Ace Supplies so they'll have them ready. And while you're gone I'll have a look at your station wagon."

Howie looked up, a grateful-puppy expression in his eyes. "Swell, Mr. Wilson." He took the list Gus handed him and climbed into the Model Garage truck.

"But you can forget about the fuel pump. Nothing wrong with it." He stepped on the starter and drove off.

Where'd it come from?

A BAKER'S DOZEN: Not 12 of anything, but 13. In the 17th century "Merrie England" was pining under the Puritan austerity of Oliver Cromwell. Bakers were ordered to bake smaller rolls to conserve flour. Housewives objected—so strenuously that bakers slipped in an extra one "for good measure."

WHEN Stan Hicks came out of hiding, he found Gus with his head under the station-wagon hood. "Hi, boss, have you forgotten Pete Bassett is expecting you?"

Gus straightened up, "No, Stan. And if he phones, tell him I'm out on an emergency. Now start this wagon and we'll see how she sounds."

As the engine started and settled into a smooth idle, the office telephone rang. And from then on it continued to ring every five minutes with Stan running back and forth to answer it.

Working on the engine, Gus moved the throttle linkage. It raced briefly, then began to sputter. Just before stall, he let it settle back to idle and asked Stan to turn the wipers on. Each time Gus gunned the engine, the wipers nearly stopped.

"Cut it," Gus called. Stan did, and ran to answer an insistent telephone ring.

Gus was at work on the engine innards when his assistant reported back.

"That was Bassett again. His help's left for the day. He's alone at the plant with a no-go truck, a big ready-to-go order, and that midget sports car of his that hasn't room for an extra package of chewing gum. And he's mad at you."

"I was hoping for something like that," came the muffled voice of Gus as he backed off the last fuel-pump mounting bolt.

CONTINUED

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Good advice to Car Owners...

Casite's 3-Zone Engine Protection

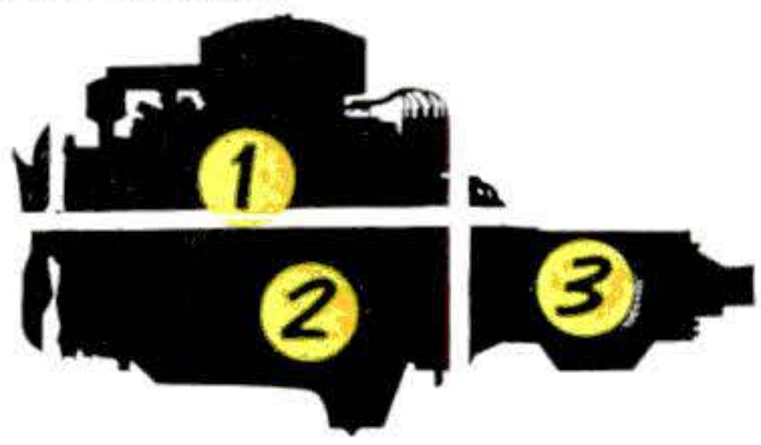
adds new power and performance!

Now three new Casite products reduce friction, keep your car's engine and automatic transmission clean and at peak operating efficiency.

Developed by the technical staffs of Casite and its parent organization, Hastings Manufacturing Company, these products are the results of years of specialized research in the field of automotive maintenance.

You probably are aware of the damaging effects of modern stop-and-start driving on high compression engines and automatic transmissions. In our own engine testing laboratories, we've seen how acids, rust and corrosion—from condensation caused by fluctuating extremes in operating temperatures—cause poor performance and deterioration of engine parts.

Utilizing the latest proved chemical discoveries, Casite technicians have developed and perfected scientific correction *and* protection for the three vital areas of car performance—the firing zone, the friction zone, the transmission zone. Each requires specific treatment to keep your car's "power plant" clean, at top operating efficiency, with minimum friction.



The three Casite products perform these specific functions. Each is a liquid concentrate additive—for gasoline, for crankcase oil, for transmission fluid.

You can use them without mechanical labor costs or expensive parts dismantling or replacement. In a few minutes you're on your way, with noticeable results.

This is the Improved Casite Tune-Up, for the firing zone. It's the nation's favorite "tune-up in a can," now greatly improved with spark plug and carburetor cleaner and acid inhibitor.

It is recommended for use in the gas tank or carburetor air intake to free valves and rings, and clean carburetor and spark plugs.

Also, for use in the crankcase oil for quicker starting, less start-up wear, and to break in new or rebuilt engines. The price is only $1.25.

For a quiet smooth engine, you'll want Casite 3-C, with Barimen. This is a new heavy duty crankcase concentrate developed for the friction zone. Added to motor oil, it gives you a tougher oil that won't thin out—oil that *cushions* the load on every working part, cuts friction and wear, reduces oil consumption, too! Casite 3-C stops hydraulic lifter noises, quiets and smooths the engine. Cleans the engine, and keeps it clean —protects against acid, rust and corrosion. Costs only $1.50.

Casite "Smooth-Seal" is the latest scientific development for automatic transmissions. It reduces jerks and roughness, assures smooth, quiet operation.

It stops and prevents leaks due to hardening or shrinking of transmission seals. Also reduces shock and wear, enables parts to last longer. Only $1.95.

Most service stations have a supply of Casite products to protect your engine—or can get them in a hurry.

Just ask for Casite Tune-Up, 3-C and "Smooth-Seal." Use them with confidence. If you're not entirely satisfied with the results, let us know. We'll promptly send you double-your-money-back. That's how strongly we feel (and millions of car owners do, too) that Casite products will solve many of your engine problems, reduce repair bills—and keep your car rolling for many thousands of carefree extra miles!

HASTINGS MANUFACTURING CO. • HASTINGS, MICH.

Casite, Piston Rings, Oil Filters, Spark Plugs

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When Howie Stone drove up in the Model Garage truck, Gus had just returned from a test run in the station wagon. He was putting the engine through its paces. It accelerated smoothly, ran like a top.

Bug-eyed, Howie jumped out. "What was wrong?"

"Never mind that now," Gus said. "It's running—and I suggest that you get right over to Pete Bassett's plant."

"Huh? Mr. Bassett wants nothing to do with me. He made that plain enough after I missed the train the other day."

"I think he'll be glad to see you now, though," Gus said, sliding out from behind the wheel of the station wagon.

"Jim's so ashamed of our old car."

"Now get in, boy, and get going—but don't tell Pete you've even seen me."

As Howie pulled away, Stan cocked his head and looked at his boss. "Talk about a mother hen and her chicks. But wait till he hears about that fuel pump." The phone rang. "What'll I tell Pete?"

"Tell him if his shipment misses that train it serves him right . . ."

"For trusting an old fraud like Gus Wilson," finished Stan laughing.

LATER that evening there were lights on in the Model Garage. Gus was doing some work on his own car when Howie Stone walked in. There was a broad grin on his face.

"You were right, Mr. Wilson," he said. "Pete Bassett was glad to see me. And you know what?"

"No, what?" said Gus, pulling a pipe from his coveralls pocket and filling it.

"He had an order all ready for me to deliver. Said if I made the train he'd sign a contract with me for all his deliveries. I made the train."

"That's fine, Howie. Now, I've got a pot of coffee brewing in the office. How about joining me?"

"Sure, thanks. I did want to ask you what was wrong with my car."

When they had taken their first sips from steaming mugs, Gus broke the news. "The fuel pump wasn't operating."

Howie put his mug down with a jolt that splashed coffee over papers on Gus's littered desk. "But it was a new pump. I put it in myself," he protested.

"I didn't say the pump was bad, but that it wasn't operating. It's like this:

"Combination vacuum-booster fuel pumps have a stronger diaphragm spring than the single-purpose types. Once in a while the extra pressure causes the cam to wear. The more it wears, the rounder it gets. Eventually there's hardly enough lift to keep the pump supplying fuel for a slow idle."

As Howie nodded in understanding, Gus went on. "When you race the engine, the carburetor bowl empties faster than the feeble pump stroke can fill it."

"But why should a job like that cost $100?" Howie asked.

"Well, to fix it means removing the radiator, cylinder heads and all the valves in order to replace the camshaft."

"And you did all that while I drove to Milltown and back," Howie said in admiration. "Well, with the Bassett business I guess I can afford it."

"Your bill is $14 for an electric fuel pump," Gus said. "My time is free in exchange for picking up those parts for me."

Howie pondered that one for a minute. Then: "I get it. An electric fuel pump doesn't need the camshaft to operate it. It's self-powered. You switched pumps."

"Right," Gus said. "Mechanics may have one-track minds, Howie, but we know a good switch when we see one."

Next Month: Gus keeps Santa on schedule.

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Just wait till you see it. Everything about the '60 Chevy, every styling accent, every engineering detail, has been polished and refined to a degree of perfection never before thought possible of a car in Chevrolet's price class.

Picture practicality and economy combined with the luxury and hushed comfort usually associated with high-priced cars. That's Chevy! You have to see it up close to appreciate its fine workmanship. You have to take a turn behind the wheel to know its astonishing smoothness and almost total absence of road hum and vibration. We'll admit our enthusiasm's showing just a bit — but once you've dropped into your dealer's we're sure yours will be, too. *There's nothing like a new car—and there's never been a new car like this '60 Chevrolet!* . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

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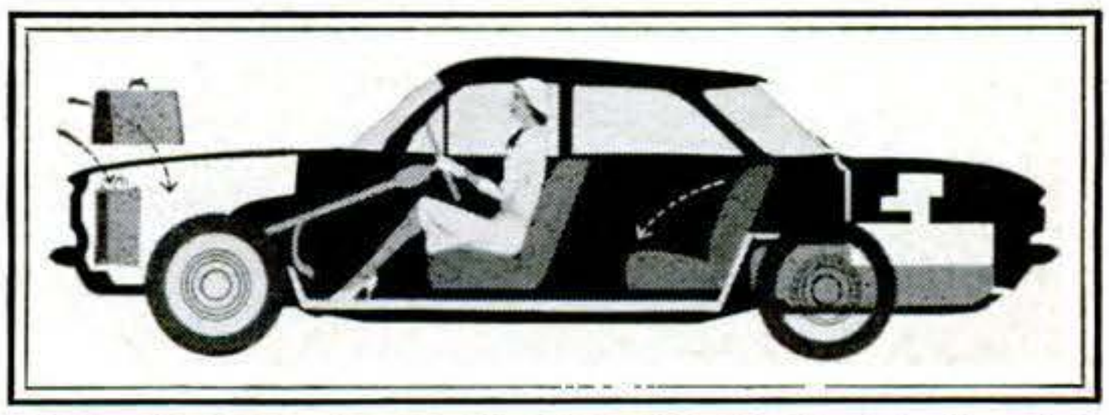
You have your choice of two Corvairs—this one's the de luxe Corvair 700.

America's only car with an airplane-type horizontal engine!
America's only car with independent suspension at all 4 wheels!
America's only car with an air-cooled aluminum engine!

The rumors about this one were right—but they didn't go far enough. Because here, for the first time, is a truly compact, economical U.S. car that retains the ride and 6-passenger comfort you're used to in a big one. The key to this small miracle: America's first and only *rear-mounted aluminum engine*—a revolutionary 6-cylinder power plant that combines compactly with the transmission and drive gears in one lightweight package. You'll get up to 30% more miles to a gallon and—because this engine is *air cooled*—you'll never have to fuss with antifreeze.

Corvair's size—almost 5 inches lower, 2½ feet shorter, 1,300 pounds lighter than conventional sedans—makes it a joy to jockey through traffic and park in tight spots. Yet its unique Unistrut Body by Fisher offers plenty of room for 6 broad-shouldered passengers. And, thanks to Corvair's rear engine, the floor is practically flat, front and rear, so there's generous foot room. Shifting engine weight to the rear also adds extra ground-gripping traction and gives better compact car handling and braking. And with *independent suspension at all 4 wheels*, Corvair rivals much more costly cars in the poised, unruffled way it rides.

A price your budget will appreciate. Wonderfully practical as all these advances sound, you'll find the most practical thing about this new Corvair is its price. Make it a point to visit your Chevrolet dealer soon—and see what a wealth of engineering a modest amount of your money buys! . . . *Chevrolet Division of General Motors, Detroit 2, Michigan.*



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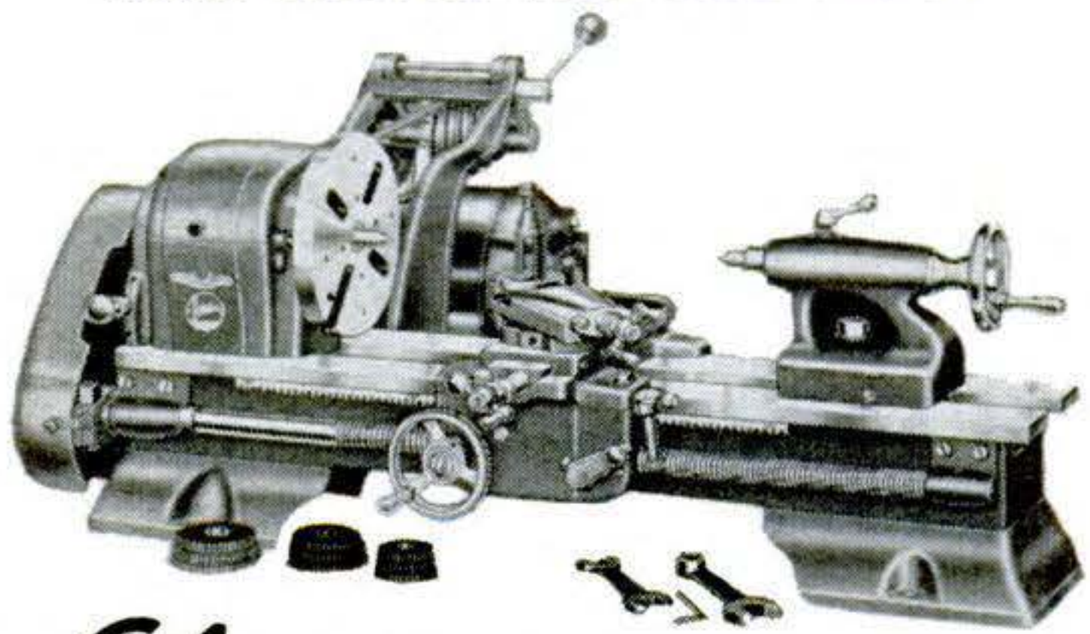

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T-Men's New Tricks Trap Bootleggers

[Continued from page 94]

tailers. The most glamorous specialists—though not necessarily the best paid—are the delivery men. The T-men refer to them as "transporters." They haul corn likker in fruit jars or five-gallon cans (the kind varnish comes in) from the still to the wholesaler's drop. That's all they do, just pick up and deliver.

Some transporters resort to disguise (a hearse, a kerosene tank truck), but most rely on horsepower and a sure feel for traction on narrow mountain hairpins.

The revenue agents chase them in police interceptors—Fords, Chevies or Plymouths specially equipped at the factory with power pack, husky generator and heavy-duty transmission—or occasionally a captured bootlegger vehicle pressed into government use. A few transporters return the compliment by driving police interceptors themselves (they get them somehow, even though interceptors supposedly are sold only to official law agencies).

But most transporters' hot cars are very hot (125 m.p.h. and more) and very individual. Until recently the preferred chassis was a '39 or '40 Ford or Chevy (inconspicuous, light and good on curves). Under the hood, however, there was nothing plebeian: shaved heads, racing cams, multiple carburetors and all the rest of the speed-shop paraphernalia. Some of these jalopies concealed Cadillac engines, a few Offenhausers (designed for the Indianapolis 500). One man tuned his car so delicately he would never drive it except on "business." He hauled it from the shop to his home on a truck, and took it back to the shop after each run.

Practice makes perfect. Several of the Southern transporters pay their rent by hauling liquor, and pick up extra change in stock-car races— this provides both a cover for ownership of an outlandishly fast automobile and a chance to perfect driving techniques. All practice their runs, driving the route empty to see just how fast they can take each curve. (The Federal agents practice, too.)

Radios are another effective weapon against bootleggers—particularly handie talkies, which permit precise timing of a raid. It's easier to win a conviction if the moonshiners are caught in the act,

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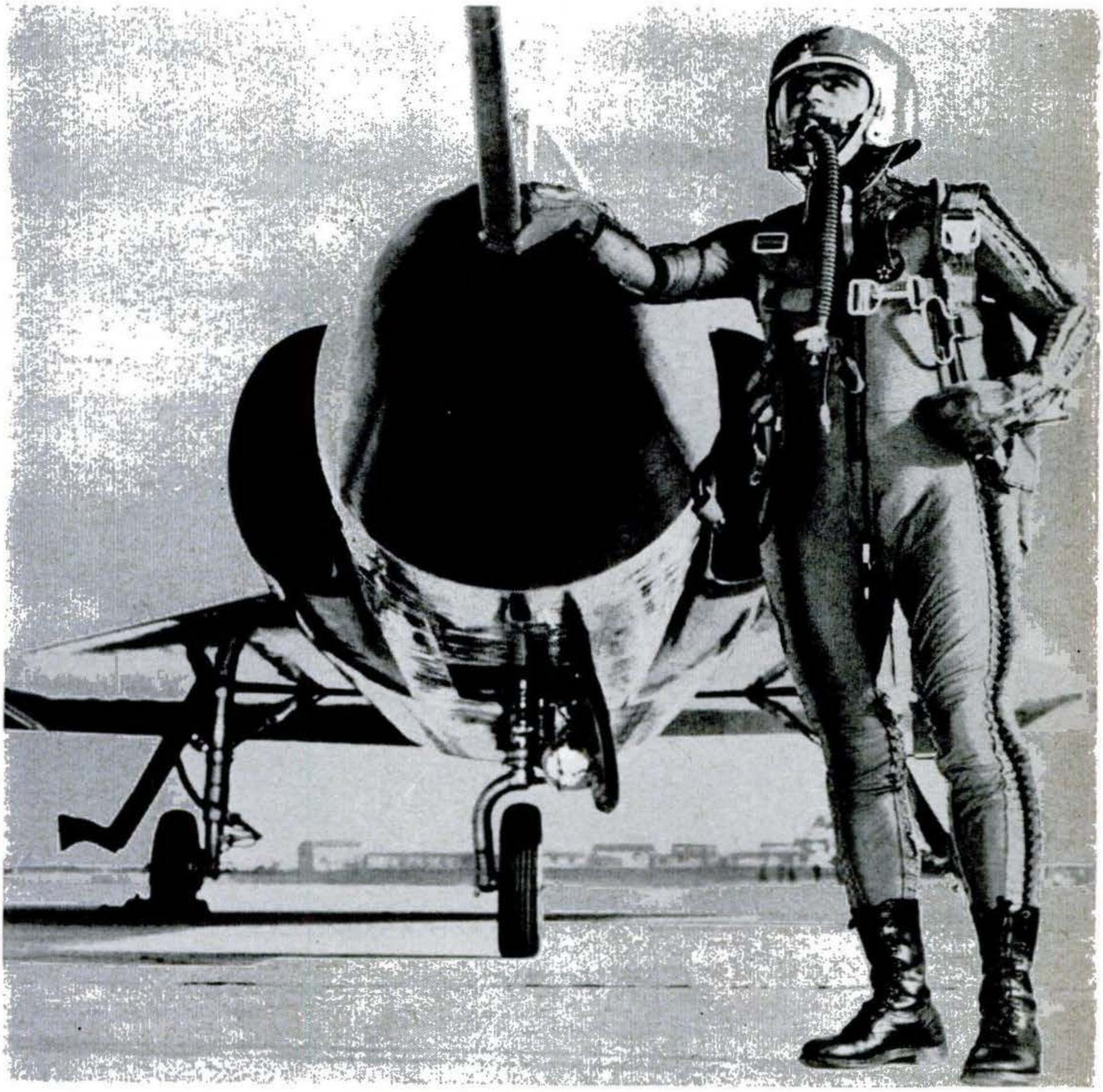

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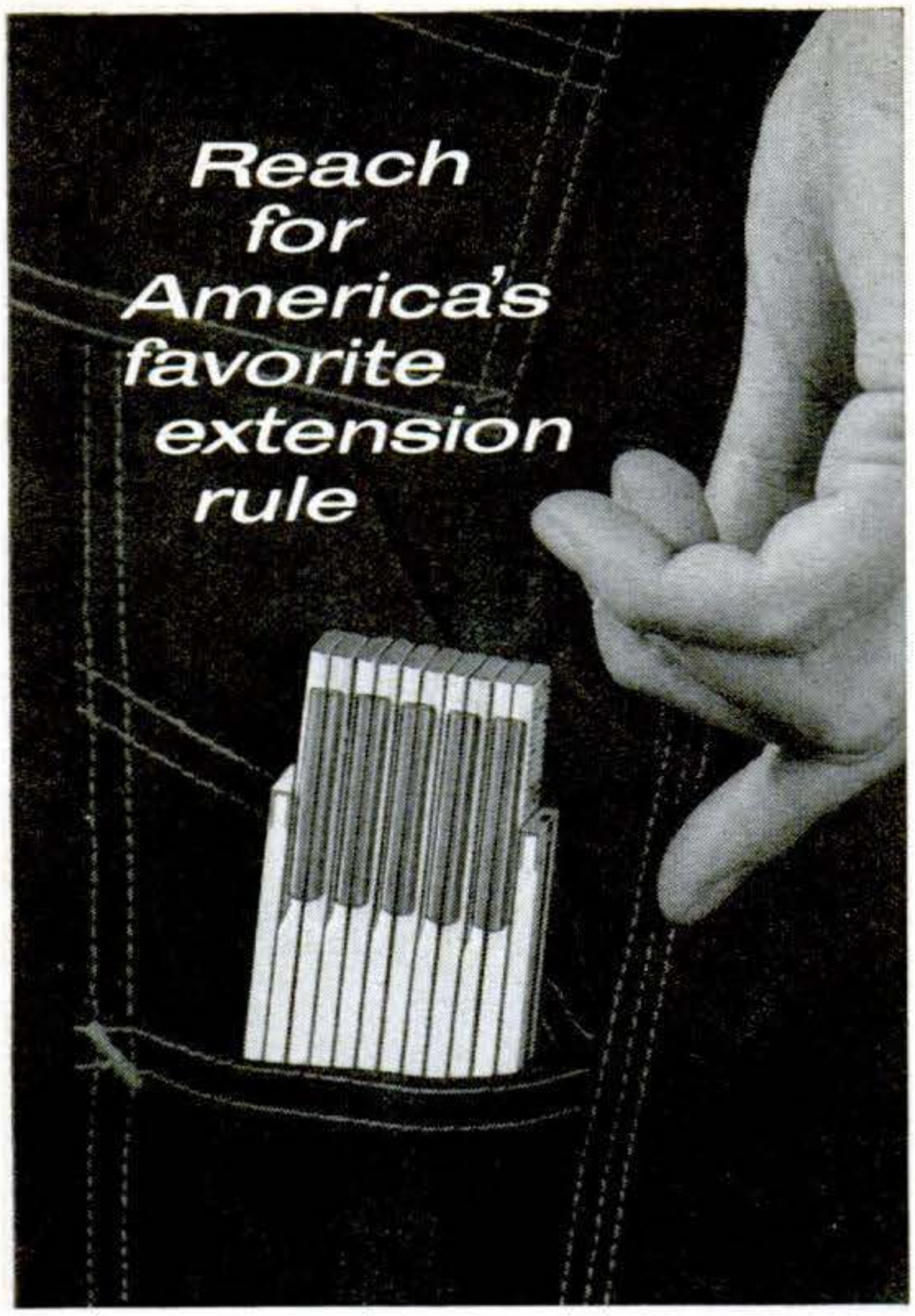

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TAPES • PRECISION TOOLS

T-Men's New Tricks Trap Bootleggers

and not just lounging around some vats. But occasionally all this modern gadgetry backfires.

One time, a Federal group leader crouched on a North Carolina hilltop, directing a raid on a backwoods still. When the time was ripe, he radioed, "Hit it." His men moved in for a clean sweep, exactly as scheduled.

What he didn't know was that, at the same moment hundreds of miles away in Chicago, another crew of agents was deployed around a warehouse known to conceal an alky still. Their ears were glued to handie talkies, too, waiting for the attack signal. By one of those freaks of radio propagation that send short waves skipping across abnormal distances, the Chicago men heard the North Carolina command. They broke into the warehouse an hour too early, seizing the still but missing the gang they had so carefully planned to trap.

The bootleggers keep up with the times, too—airplanes, speedboats, two-way radio and all the rest. Recently, after newspapers reported a delicate chemical analysis that showed which ingredients give whiskies their distinctive tastes, the research team got a letter from a man in Texas. He'd been in the bootlegging business for 50 years, he said, and wanted to buy some of that bourbon flavor—he had the rye problem pretty well in hand.

Such concern for palatability is unusual. In the South cracked grain (chicken feed, for instance) is cooked with yeast in open vats. The starch ferments to sugar, and the sugar ferments to alcohol. After five to seven days (depending on how much store-bought sugar is added) this mash is boiled in a big pot and the vapor condensed (occasionally by running it through an auto radiator). The product is moonshine whisky of undeniable potency—90 to 100 proof. Flavor is something else again. Nobody bothers to fish out the bodies of squirrels or dogs that accidentally fall into the vats.

Northern bootleg—made by multiple distillation of fermented sugar in costly and complex column stills—doesn't have any flavor at all. What comes out is almost straight alcohol (180 proof). The customer dilutes and flavors it himself

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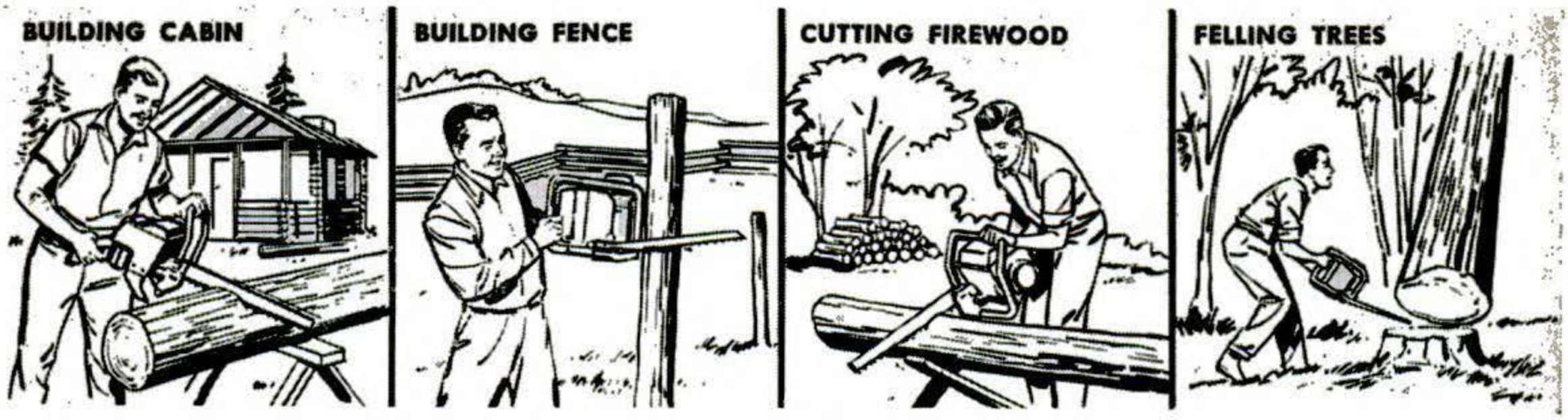

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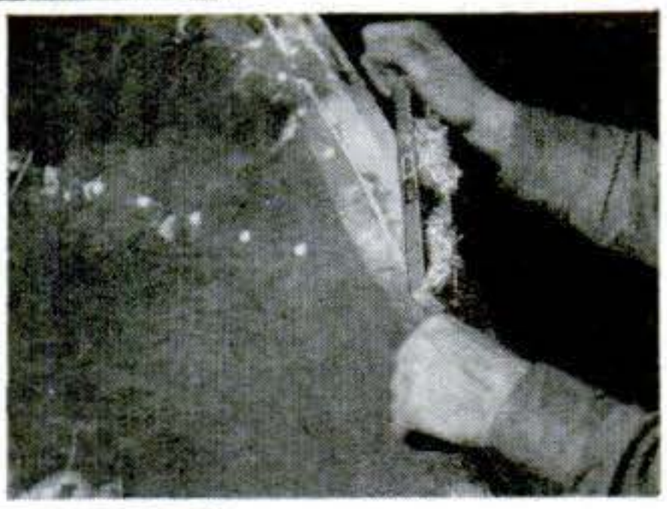

SURFORM File with regular cut, flat blade hogs off excess stock on oak boat bow. $2.69

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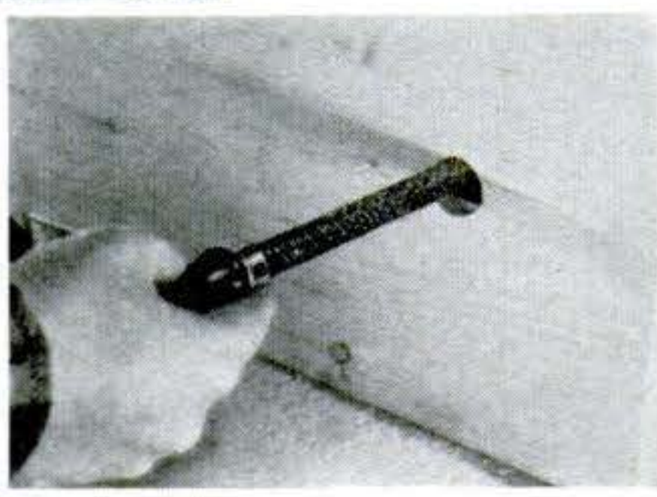
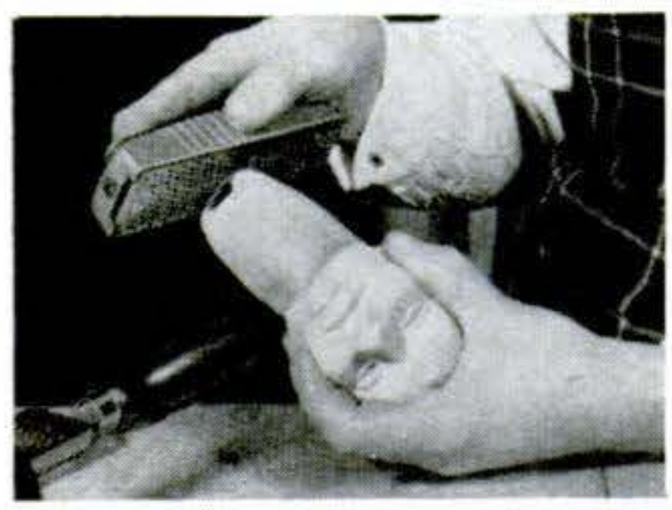


SURFORM Round File smoothes and shapes hole in wood to size. A new SURFORM tool. $2.39



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T-Men's New Tricks Trap Bootleggers

(generally with fruit juice or soda pop).

This dependence on sugar—it takes 100 pounds to make six gallons of alky—is a major reason the bootleggers have been having such a rough time lately. A law passed recently gives the tax men control over the raw materials that the bootleggers might use—mainly that means sugar. Sugar dealers can be required to report sales. Most dealers have always cooperated, but there are a few operators who "forget" sales, and the law puts a stranglehold on them. Today, anybody who buys a load of sugar had better be ready to prove he makes candy or cookies out of it.

If you get the impression of a polite game between tax agents and bootleggers —played according to established rules, with little more personal animosity than appears in high-school football—you're partly right. The agents reminisce about the 95-m.p.h chase that was interrupted when the revenooer rolled on a curve. The transporter he was after stopped and came back to see if anybody was hurt. Then he bargained for a headstart—and helped get the government car on the road again.

Yet all is not chivalry. Bootleggers north and south are racketeers making a fast buck outside the law. The estimated take: $3,000,000 *every day*.

Chief T-man John Lathem says, "Six organized mobs are now active on the East Coast. Their chief income is derived from illicit alcohol." The tie-up with other crime—bookmaking, narcotics, white slavery and hired murder—is certain, although seldom provable in court.

The comic-strip image of the South's rustic corn-squeezers is largely a myth, too. Actually, much of the moonshine output, even in the hills, is organized into combines and managed by executive types who are no more country bumpkins than is Johnny Dio.

The bootleggers play by the rules when meekness is smart. But like the rest of the underworld, they are also wise in the uses of bribery, extortion, kidnaping, arson and the one-way ride.

The Alcohol and Tobacco Tax Division agents share with immigration officers the tragic honor of losing more men "killed in line of duty" than any other Federal police.—*Martin Mann*

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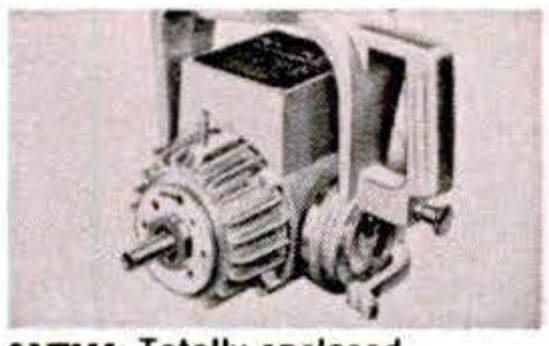

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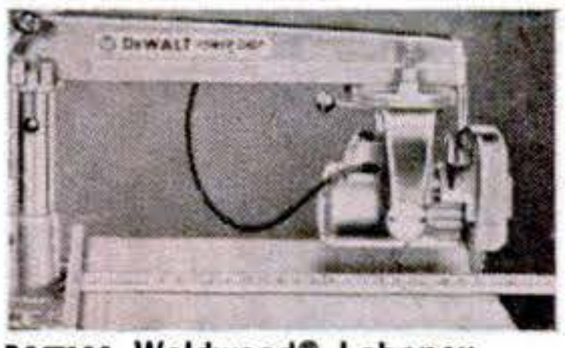

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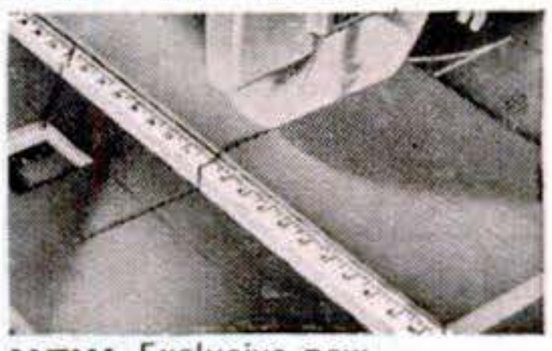

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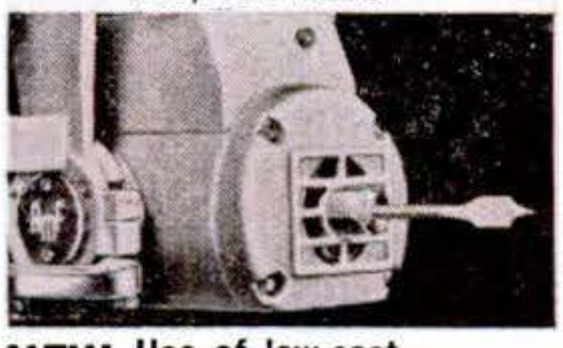

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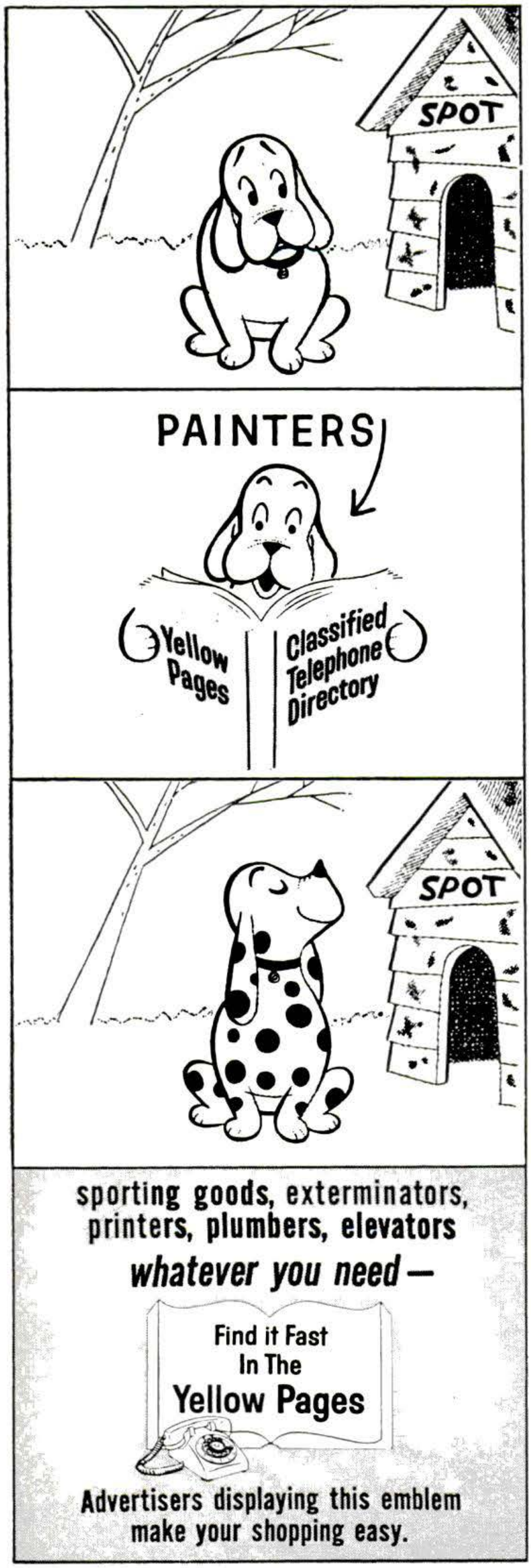

New Burners: Smaller, Hotter, Cheaper

[*Continued from page 132*]

to as low as 125 degrees and by leaving practically no burnable products in the flue gases.

Jet-style heating. An improved Jet-Heet furnace, just licensed for distribution by BTU Industries, Inc., Englewood, N.J., works on the principle of a jet airplane engine. It, too, requires no chimney draft, and is designed—codes permitting—to take a Type B vent. Its strong points are compactness, ease of installation, lower cost.

It heats one-quarter the usual volume of air, but stokes it up nearly four times hotter than regular furnaces. It sends the air through tiny two-inch insulated hoses.

At the delivery end, the super-hot air is blended with room air to produce the desired temperature and volume. It doesn't need return air lines.

The Jet-Heet system has been tested in 2,000 home installations, was used in Antarctica by the Navy, and is now being sold to drive-in movies to supply both heating and, by means of a companion unit, cooling. It's a furnace package equally well suited to new homes or remodeling.

Makes its own draft. A new furnace by Iron Fireman has no blower in the oil burner, nor does it depend on natural chimney draft. Factory-adjusted for maximum efficiency, it never needs readjustment, according to the maker. A fan in the heat exchanger provides a precisely controlled flow of combustion air under all conditions.

Combustion is so much better from the instant the burner starts that smoke and soot are completely absent. Flue temperature is a good 200 degrees cooler than standard and there is no heat loss up the chimney due to uncontrolled draft during burner standby periods.

Initial cost of the furnace is higher, but you'll save on installation and probably on chimney costs in a new house. Savings are said to be a third on fuel, even more on service.

A quieter burner. Flame pulsation, that familiar throb you hear from oil burners, has long plagued the industry. No one—until now, at any rate—seemed to understand its causes. Burner servicemen use various makeshift remedies—

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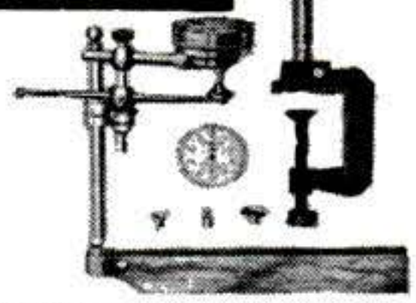

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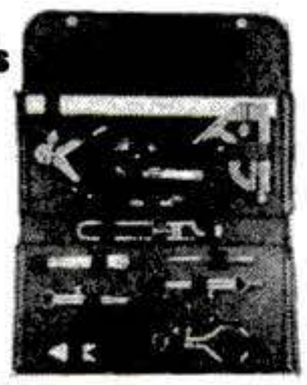

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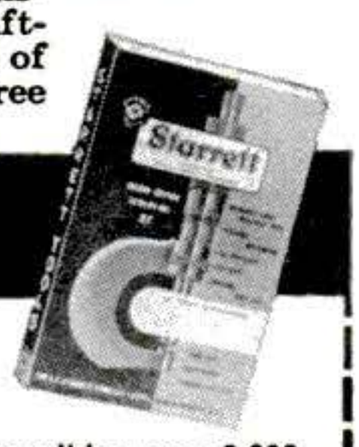

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New Burners: Smaller, Hotter, Cheaper

an intentional air leak around firebox doors, excessive draft, reduced firing rates —but these waste fuel and often aren't effective.

A new burner by Hart Heat, Peoria, Ill., is said to have the problem whipped. The designer, Earl K. Smith, says he has found the exact cause of the trouble: Conventional burners spray oil from the nozzle to produce one flame shape, then blast air into the gun tube that tries to make a different shape. The noise is the sound of battle in the firebox for control of the flame shape.

The new burner gives complete control to the nozzle and sneaks in the air in such a way that it can't start a fight. Result: quieter operation, no odors, less nozzle plugging, improved efficiency. The new burners are being offered as replacement units to fit almost any furnace.

Cheaper hot water. New oil-fired water heaters can deliver hot water faster than competitive heaters. They cost less to operate, too—reports claim up to 70 percent less than electricity, 40 percent less than gas. The initial cost is likely to be higher—$50 to $100 more. They require a flue, but it can be the same one the furnace uses.

These water heaters are not to be confused with pot types burning kerosene. They are gun type, employing burners like those used in most oil furnaces.

The hot-water output of even the smallest oil-fired unit is enormous. A 30-gallon tank size will turn out 30 gallons of 100-degree rise water every 15 minutes.

Electricity at half price? It may be a practical reality sooner than you think. More than half the present cost of electricity lies in the expense of transmitting it from the power plant to your home. By producing your own, you'll be able to rout the meter reader, save the difference. A 20-hp. oil-fired gas turbine will turn your home generator quietly, reliably, economically.

The vital components needed for a home generator already exist in perfected form: 1) the small generator, 2) the efficient heat exchanger, 3) the small turbine. All that remains to be done is to bring them together. When the turbine price is right, it will be done. Experts say it's not more than five years away, perhaps much less.

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Not a cumbersome cast iron model, but sturdy, lightweight, portable — and safe. Unique blade guard protects even the littlest hands. Simple operation — make gifts, toys, furniture, practical items for the home.

Treat your whole family to a Dremel Moto-Shop. America's most popular and useful multi-purpose tool.

- **Large capacity** — Has 15" throat — cuts 1¾" wood, light metal, tile, plastics.
- **Powerful ball bearing motor** — not a vibrator. 3,450 strokes per minute.
- **4-way blade holder** — saws in any direction.
- **Lightweight,** sturdy — easy to carry or store away.
- **Tilting table** — Tilts 45° for angle and bevel cuts.
- **Adjustable table** — Raises or lowers to new blade area.
- **Economical** — Self contained — no extra motor — no belts or pulleys.

A complete power workshop in 1 compact portable unit. Two models to meet any family's need.

Model 571 Moto-Shop. Includes 15" Jig Saw with disc sander attachment only as shown above . . **$33.95**

Model 572 Deluxe Moto-Shop. Includes 15" Jig Saw with disc sander, grinding wheel and guard, wire and cloth buffing wheels, a 12 piece accessory set, and 30" flexible shaft (grinds, drills, carves, polishes, engraves, sands, sharpens) **$49.95**

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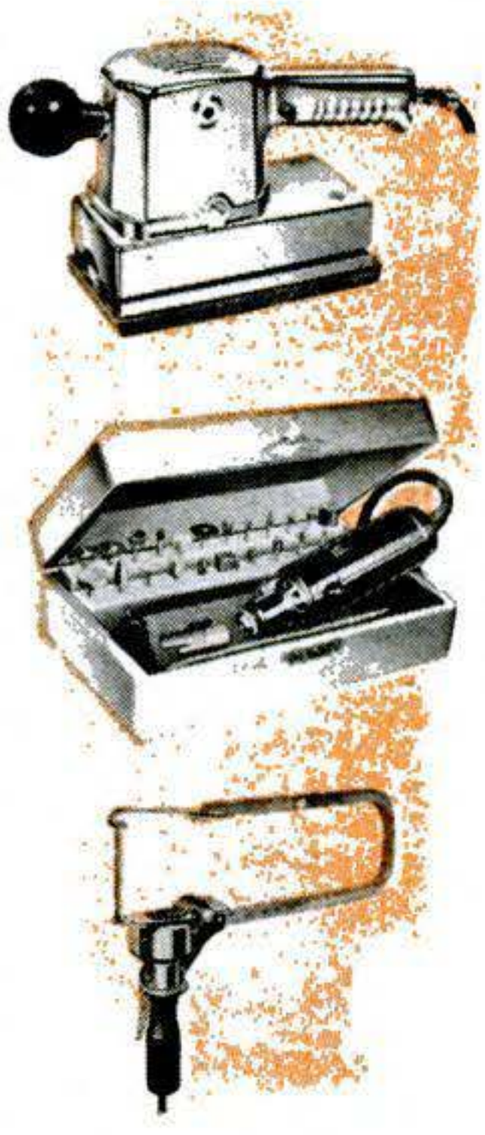

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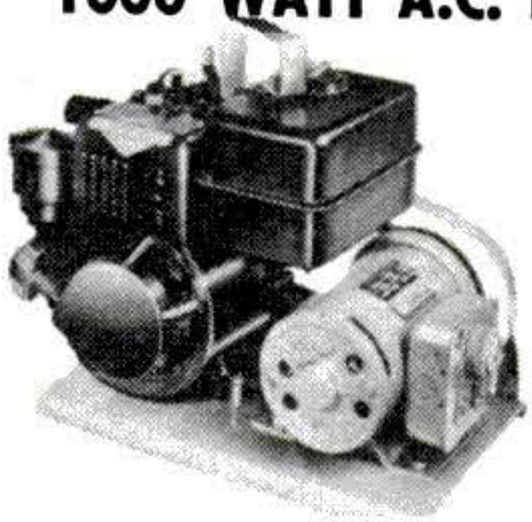

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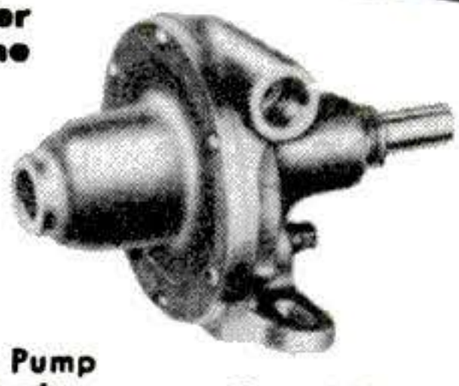

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[Continued from page 136]

and climate, the engineers can secure an enlightening picture of the slide danger. When they do, the time has come for action. This now is aimed at doing what once seemed impossible—stopping the slide before it starts.

New approach. The Highway Research Board of the National Research Council has recently issued a compilation of landslide information. It includes the results of years of experiment and investigation on the control and prevention of slides. It reports many measures that today are proving highly effective in holding dangerous slopes.

Ground water, the experts say, is the most important cause of slides. It lubricates the rock layers. Removing this water with drains, tunnels, wells, and continuous siphons prevents trouble.

Portland, Ore., once built two concrete-lined reservoirs on a clay slope. Cracks in the concrete soon showed that the entire slope was slowly sliding downhill. When engineers drilled tunnels to drain off ground water, sliding stopped.

It isn't always that easy. Steps often have to be taken to hold back the slide itself, a seemingly gargantuan task. In some places, however, crib walls, pilings, and bulkheads are proving remarkably useful. Buttresses at the foot of some potential slides help prevent them from moving farther. Dowels, or rock bolts, can pin a slope directly to a mountainside.

One of the most effective methods, especially on turnpikes, is the bench—a protective shelf dug back into a road-cut to catch incidental debris before it falls on the road or passing cars.

Last resort. If even these do not work, the engineer may remove the slide completely, remove part of it, or bridge over it and let it slide.

Japanese engineers have even rigged landslides to set off a warning before breaking loose. Strain gauges indicate when a slope is nearing the breaking point. And U. S. railroads have devices that warn when slides have occurred or are in progress. These connect to automatic block signals to slow a speeding train in time. Perhaps these two schemes will someday be combined to reduce still further the danger of a rampaging mountain crashing down on passing motorists.

You do the choosing! The Army's new "Choose-it-Yourself" System lets you pick valuable training before you enlist. Here's how it works:

1. Choose before enlistment. Choose your training from fields like Aircraft Maintenance, Radar and TV Repair, Drafting, Atomics, Printing—and many more.

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Good Eyesight in a Home Shop

[Continued from page 177]

if you have to wear bifocals some day.

Glasses are a tool, as important as any other tool in your shop. If you wear glasses, be sure they do the right job for workshop use.

Measure your actual working distance. The average critical seeing distance is 16″ to 18″, but individual arm length and posture make a difference. Fine finishing and construction work may be done as close as 11″ to 12″, while for other jobs good vision is necessary from 22″ to an arm's length away. When you have your eyes examined, be prepared to explain exactly what your needs are.

Glasses can be designed to do any specific job, but they may not meet every seeing need once the bifocal stage has been reached. For some eyes it may take several types—possibly trifocals or a specially designed double bifocal with a section at the top of the lens for reading on overhead shelves. Some hobbyists prefer single-vision lenses with an intermediate focus for general work and another pair for closer-than-average seeing.

Protect your eyes. Do-it-yourself fans run a greater risk of eye injuries than experienced workers. High-speed machines are always a source of danger from flying objects, but hand tools can also send a chip of wood or metal into the eye.

Simple plastic shields, worn over regular glasses, can provide inexpensive protection. Safety goggles made of glass or plastic offer even greater protection. Your regular prescription lenses can also be made in safety form.

The person who wears ordinary glasses is in more danger than one who wears none. An inch from the eye is an easily shattered lens that can send a sliver of glass into the eye.

Give your eyes a rest. Most home-shop work comes at the end of a day's hard work or is crammed into a weekend. This kind of concentrated and prolonged effort causes fatigue, which lessens efficiency and jeopardizes safety.

Rest your eyes occasionally. Get up and walk around. Change to another job requiring different use of the eyes. Look up from close work every 15 minutes, shut your eyes for a moment and blink a few times. Your work will go better and faster if you relax now and then.

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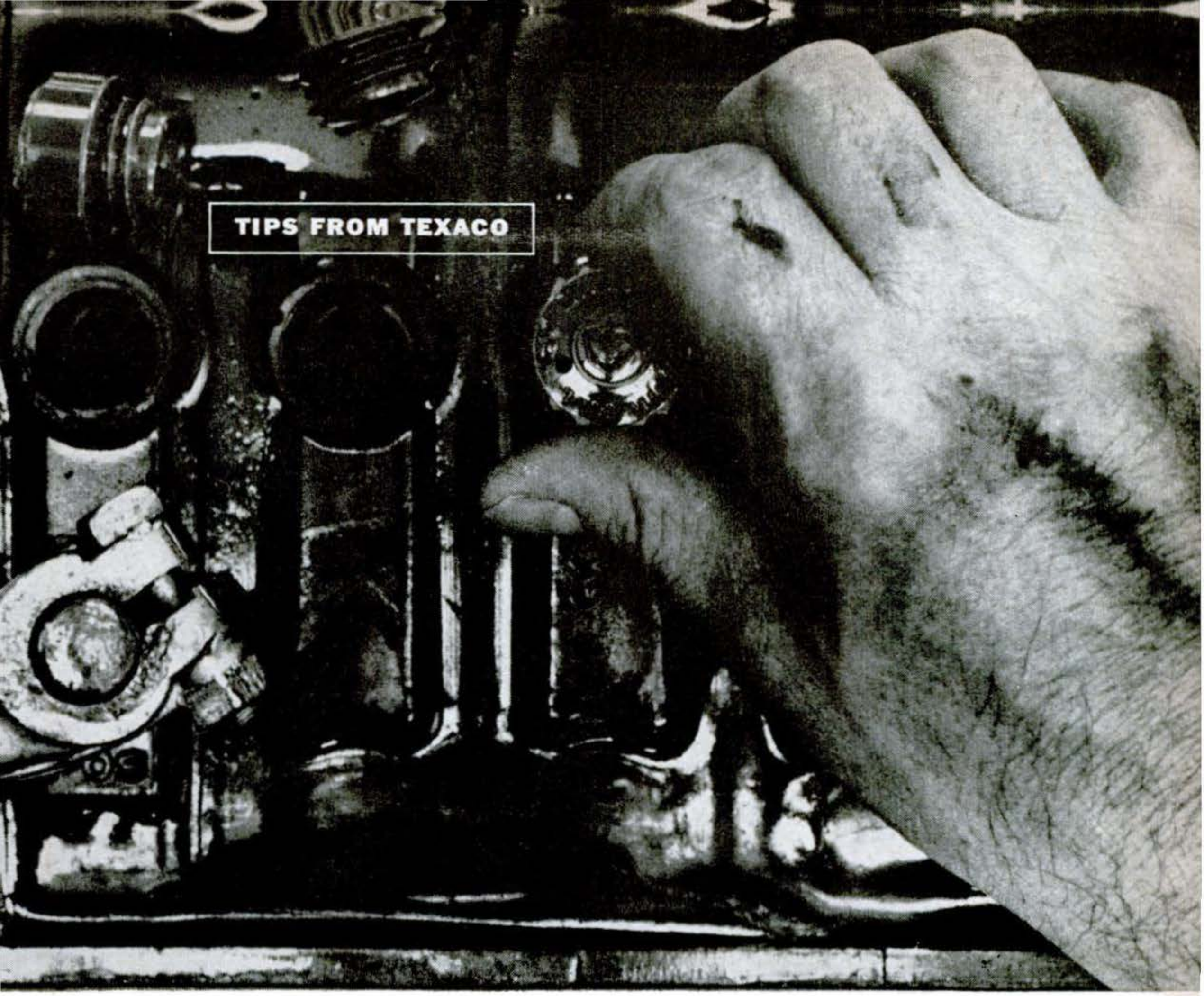

Seven ways to save the life of your battery this Winter

Cold weather is rough on your battery. At 32°F. even a fully-charged battery delivers only 50% of its power! At 0°F. only 40%.

1 Starting causes the most drastic drain. So, before you start, be sure all electrical units — lights, radio, heater, etc. — are *off*.

2 If your car has a manual shift, be sure it is in neutral *and* depress clutch. Avoid flooding engine by pressing accelerator clear to floor *once*, then engage starter.

3 If engine doesn't start, check gas supply. In damp weather, wipe off spark plug porcelains with a *dry* rag. Then try it.

4 Cold garage? Not using your car often during extreme cold weather? It will pay you to buy an inexpensive trickle charger. Hook in overnight as required.

5 Best plan for cold weather: have your battery looked at, at least every 2 weeks, by your Texaco Dealer. He will check water level, test, and re-charge if necessary. This may save the life of your battery.

6 Keep terminal clamps *clean*. (Every time you have a Texaco Fall Safe-T check-up, your Texaco Dealer will remove corrosion and protect with coating of Marfak.)

7 Take the cold-weather load off your battery and engine by keeping crankcase filled with Havoline Special 10W-30. This is the *all-temperature* motor oil that stays free-flowing, prevents cold-starting wear (with less drag on your battery) — prevents harmful varnish, sludge and deposits.

Buy the best . . . buy TEXACO

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TRADITIONAL NATIVITY SCENE. 16 figures (only 4 shown) include Christ Child, Mary, Joseph, wise men, shepherds, animals. Tallest figure 47" high. Beautiful, life-like. Entire set, only **$2.00.**

JOLLY SANTA, SLEIGH AND REINDEER will delight young and old alike! Wonderful inside or out! Jolly 6' Santa, **50c** each. 6' long Sleigh, **50c** each. 5' long Reindeer, **50c** each.

ORDER NOW! Supply is limited. Allow 2-week delivery. Sorry, no orders after Nov. 30. No stamps or C.O.D.'s. U. S. A. only. Complete instructions included. Individually wrapped, shipped prepaid. Order today. Money back if not delighted.

Douglas Fir Plywood Association, Dept. 11X, Tacoma 2, Wn.

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SO EASY to joint and file saws like new. Two hardened steel rollers keep teeth same height. All teeth cut, saw runs true and smooth. $2.95 ppd.

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Old-Timer's Wood-Finishing Formula

[*Continued from page 204*]

lution will show the greenish-yellow film of patina in a few weeks or months, depending on the wood. This is the beginning of the mellowing process, although, of course, the aging is artificial. Frequent rubbing down with a dry cotton rag is an excellent substitute for use. An additional application of the solution after a few weeks can be beneficial.

In from two to 10 days (depending on the hardness of the wood) after applying the potash solution, apply the first coat of the final finish. This consists of equal parts of a good grade of clear spar varnish, kettle-boiled linseed oil, and turpentine—preferably distilled spirit of turpentine. Raw linseed oil is not a drying oil, and is not suitable in this mixture. The turpentine is a thinner. If the mixture seems too heavy, add more.

Rub this mixture into the surface of the wood with a well-washed cotton rag free of lint, such as an old shirt; new cloth is not suitable because of lint.

Dip the cloth into the developing mixture, then squeeze it out until it doesn't drip. Rub the wood briskly with the saturated rag, and watch the figure and colors appear, sometimes so quickly that they seem to jump at you. As the rubbing proceeds, replenish the rag as needed.

When the mixture has been rubbed in thoroughly, squeeze the rubbing rag as dry as possible and rub down the surface until it looks dry. This application may be repeated in a few days if desired, after removing any excess varnish with fine steel wool. Always remove all excess varnish—that which was not rubbed into the wood—before applying wax, the final coat of the finish.

For this, use good floor wax. First, however, be sure that the wood surface suits you, for nothing will follow wax. The first two or three waxings, several weeks apart, should be paste wax, rubbed in thoroughly. Thereafter liquid wax is good if preferred.

Rub, rub, rub. Note that I stress that all the finish is to be thoroughly rubbed into the wood. This is important. Any residual oil or varnish detracts from the finish. The clear spar varnish and wax, neither of which colors, are ample filler. The surface presented by the finished job is natural wood in its natural colors. The

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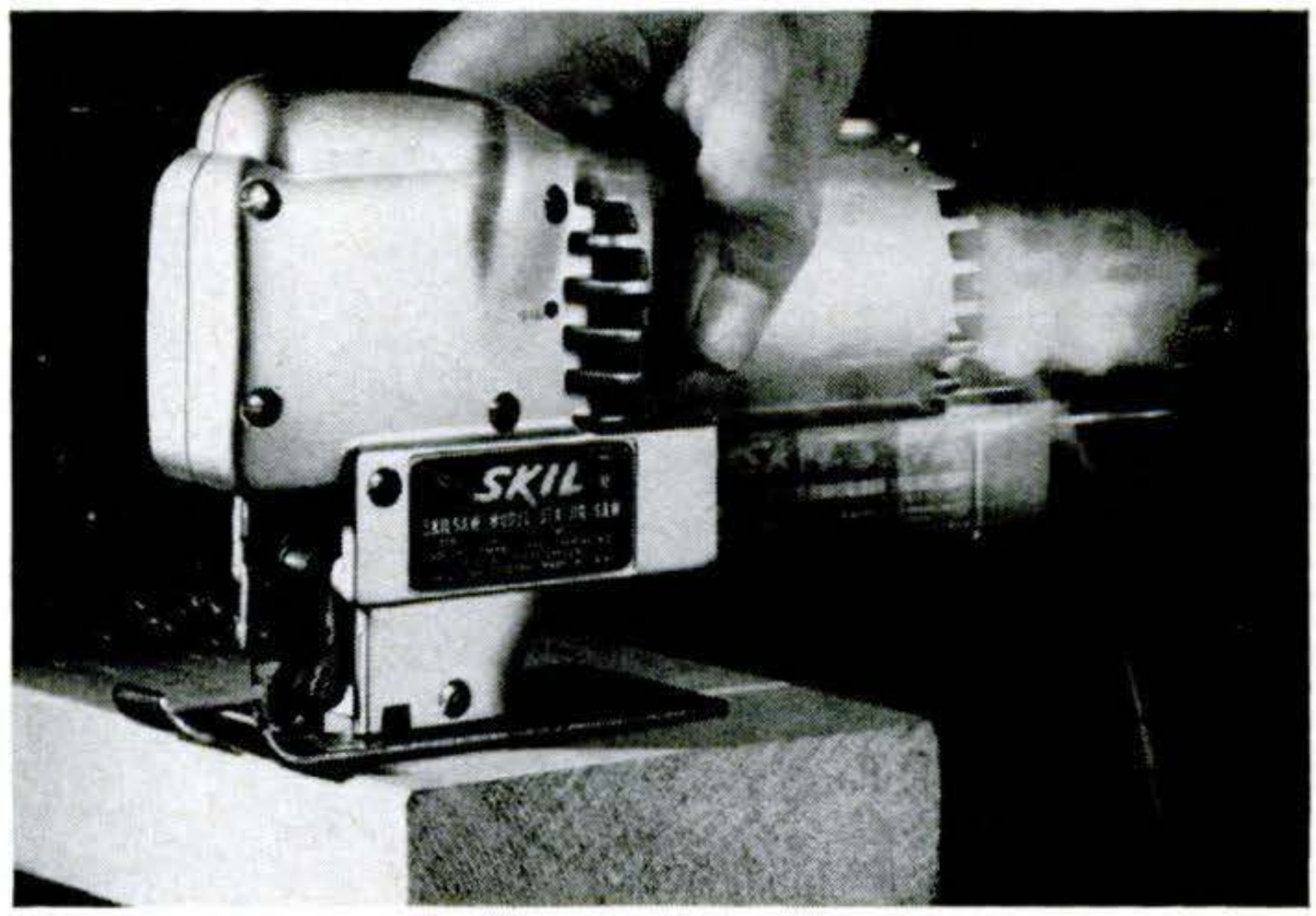
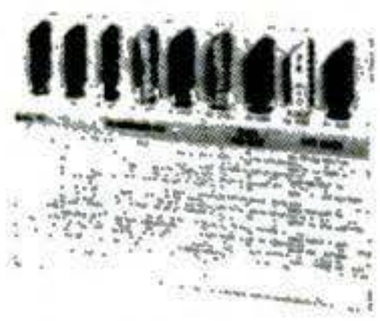
SAWS 2x6 BOARD IN 14 SECONDS!

The Skil Jig Saw is fastest—cuts anything from wood to steel, any shape from straight lines to circles.

Use the Skil Jig Saw with ease for cutting 2″ boards, plywood, plastics, metal, other materials. Veteran power tool user or beginner, you'll get professional results.

With Skil's orbital cutting action, the blade cuts on the upstroke, moves away from the work on the downstroke to eliminate blade drag. That makes it the fastest cutting jig saw on the market.





FREE! $7.50 Value!

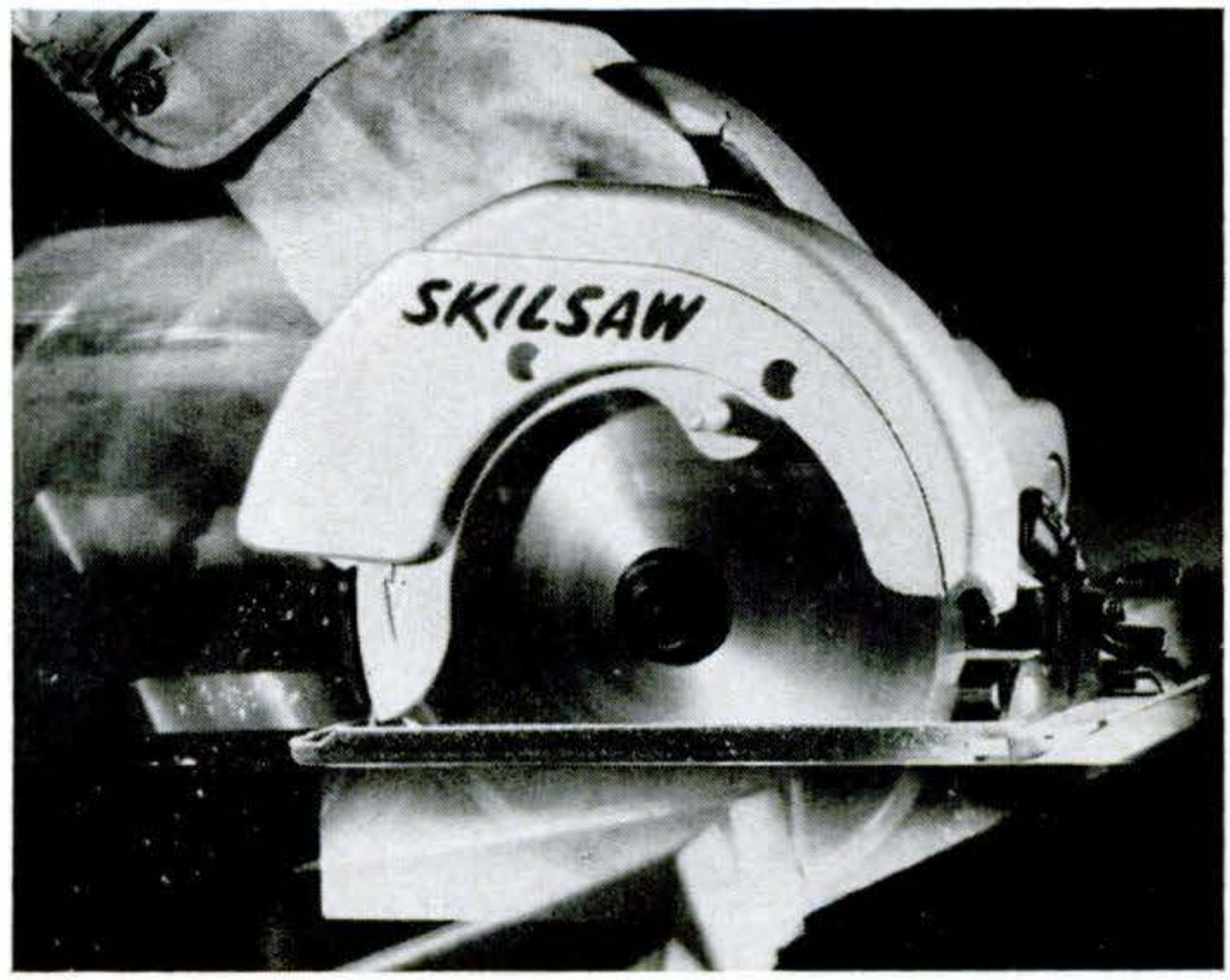
Complete 9-blade kit for cutting all materials—metal, wood, plastic—with this Model 514 Jig Saw—all for only $47.50. Limited time offer, at most Skil dealers.

EXTRA POWER, SPEED, ACCURACY!

This Skilsaw 6½″ Power Saw has a rugged 1+ h.p. motor to handle all cuts faster . . . with greater accuracy. Special features include non-binding lower blade guard and safety clutch, which disengages the blade if it jams or binds. Also has easy-to-adjust depth and bevel controls for *accurate* 45° to 90° cuts.

In short, there are more professional features on this Skilsaw Model 536 than any other saw in its price class.

See your hardware or lumber dealer today and *try* these two saws. You'll quickly recognize them as outstanding values.



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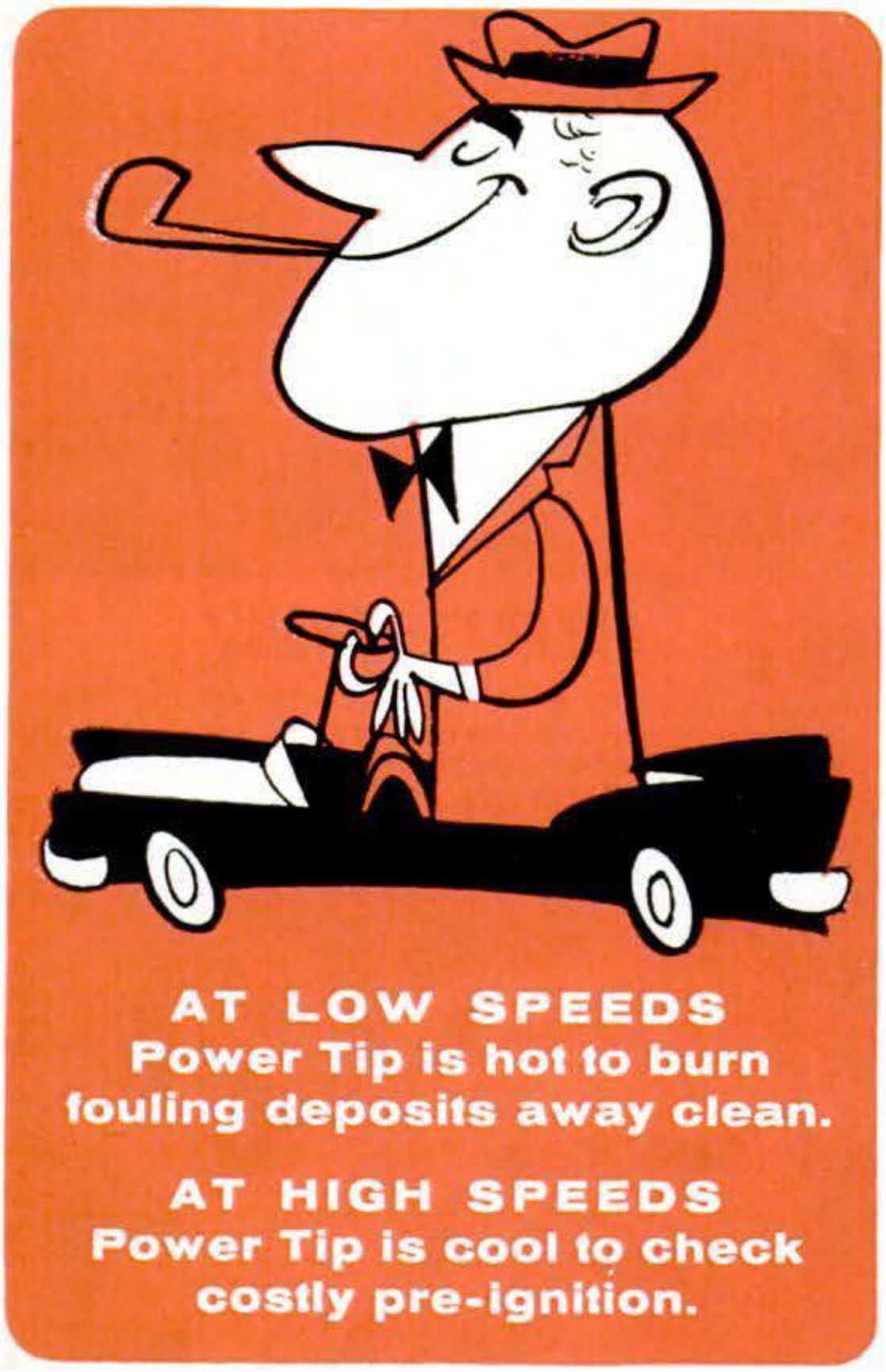

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Power Tip is hot to burn fouling deposits away clean.

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Power Tip is cool to check costly pre-ignition.

"FIRE UP" AT ALL SPEEDS WITH AUTO-LITE® POWER TIP

— the spark plug that cleans itself while you drive!

Old-Timer's Wood-Finishing Formula

number of colors present in ordinary woods is pleasantly surprising.

Application of the developer coat (which is not a coat at all, as all of it goes into the wood) has no effect on the formation of the patina film. It neither stops, retards, nor accelerates this formation, which can soon have as great a value as the item on which it forms: It enhances the beauty already brought out by the finish.

Adding color. It often happens that two kinds of wood are used together, one much darker than the other. If desired, a small amount of dry powdered umber may be added to the potash solution for the light wood. Raw umber is yellowish brown. Burnt umber is reddish brown. Either of them will add color to light wood and will appear as natural color, not as stain.

Wonderlux wood finish improves with age on any interior woodwork, be it furniture, walls, floors, or whatever. The only attention it ever needs is to be lightly waxed every year or so. Frequent rubbing down with a dry cotton rag improves it. Walls, furniture and other woodwork I finished years ago are now more beautiful than ever.

Nearly all fir plywood presents a gorgeous, interesting display of fine-grain figure. The surface ply is actually rolled off the log as paper is taken from a roll. This multiplies the grain figure many times over. Although the raw wood presents only two colors, Wonderlux brings out unseen colors in dozens of delicate shades. Very few sound, tight knots are found in plywood. These are usually very small, but also very beautiful, and well worth special care to preserve them. No other wood figure actually stands out as the hard red grain of fir plywood stands out from the soft grain.

Handling knotty pine. Knotty-pine paneling has long been popular. Finish it in Wonderlux and the pine comes to life. Each knot becomes a masterpiece; more so if care is taken to install the boards butt ends down, as they grew.

When possible the boards should be cut to length, treated with the potash solution, and, after two or more days, lightly sanded and rubbed down with steel wool to remove the raised grain. Then give one coat of the color-developing mixture

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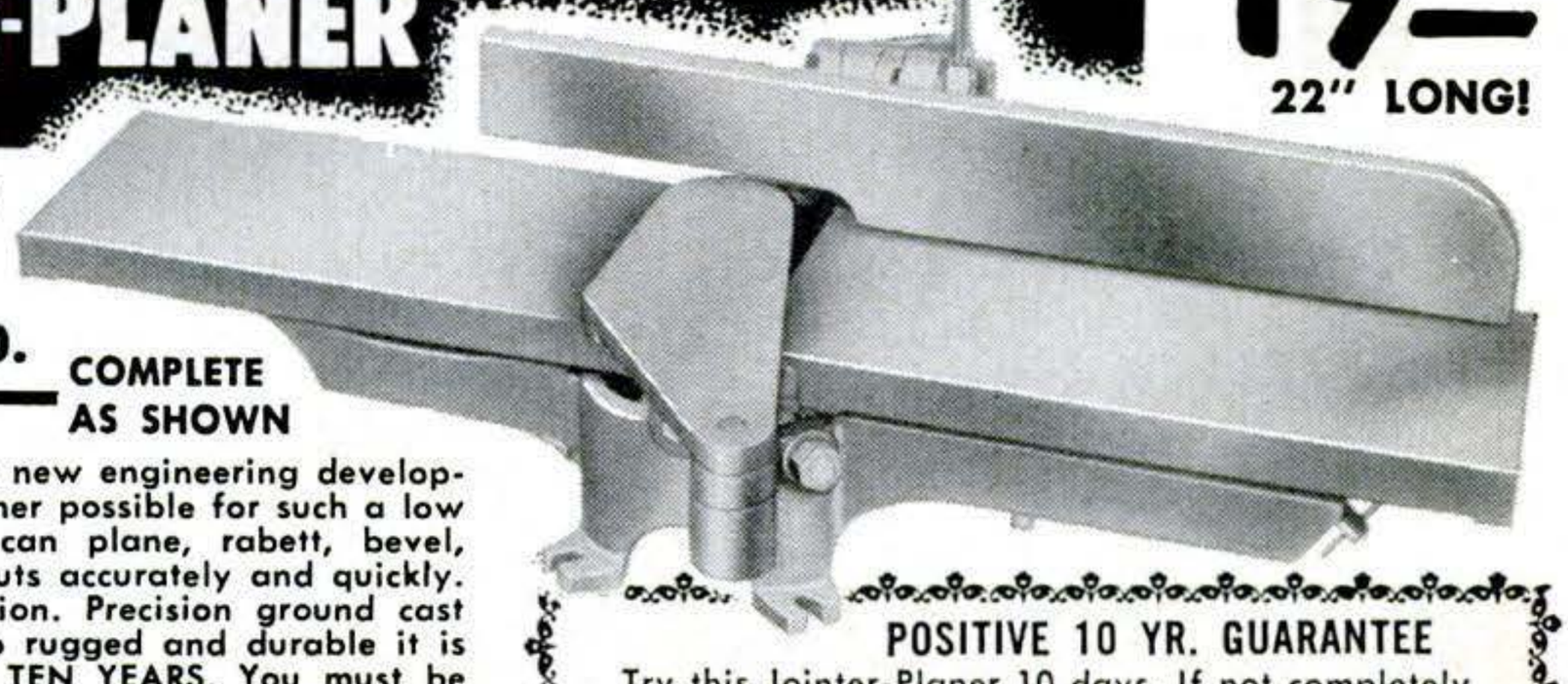

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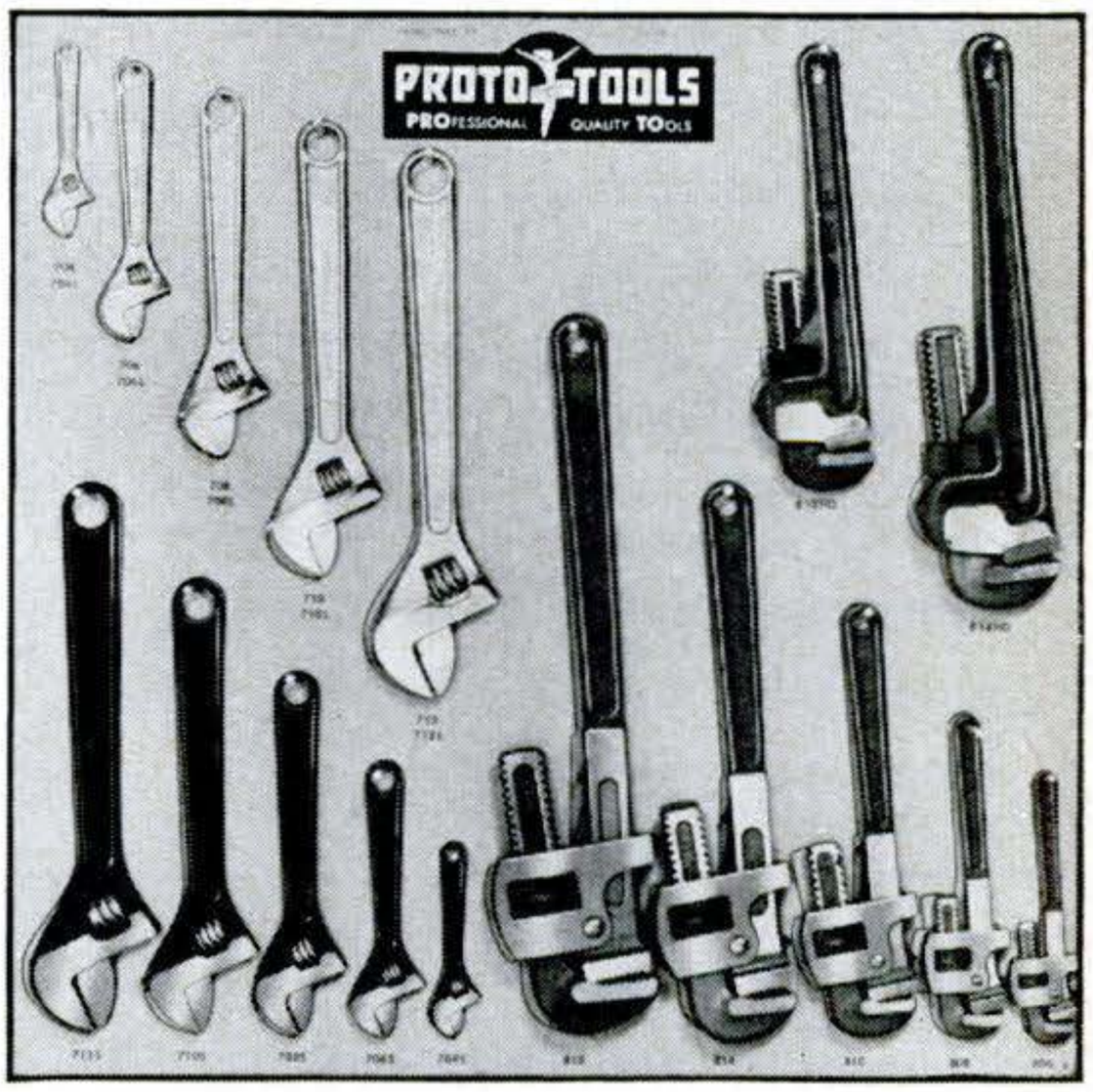

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Old-Timer's Wood-Finishing Formula to bring out the grain figure and all colors and shades of color in each board. It is then possible to arrange the boards for the most artistic effect. Leave the final applications of the finish until after the boards are in place.

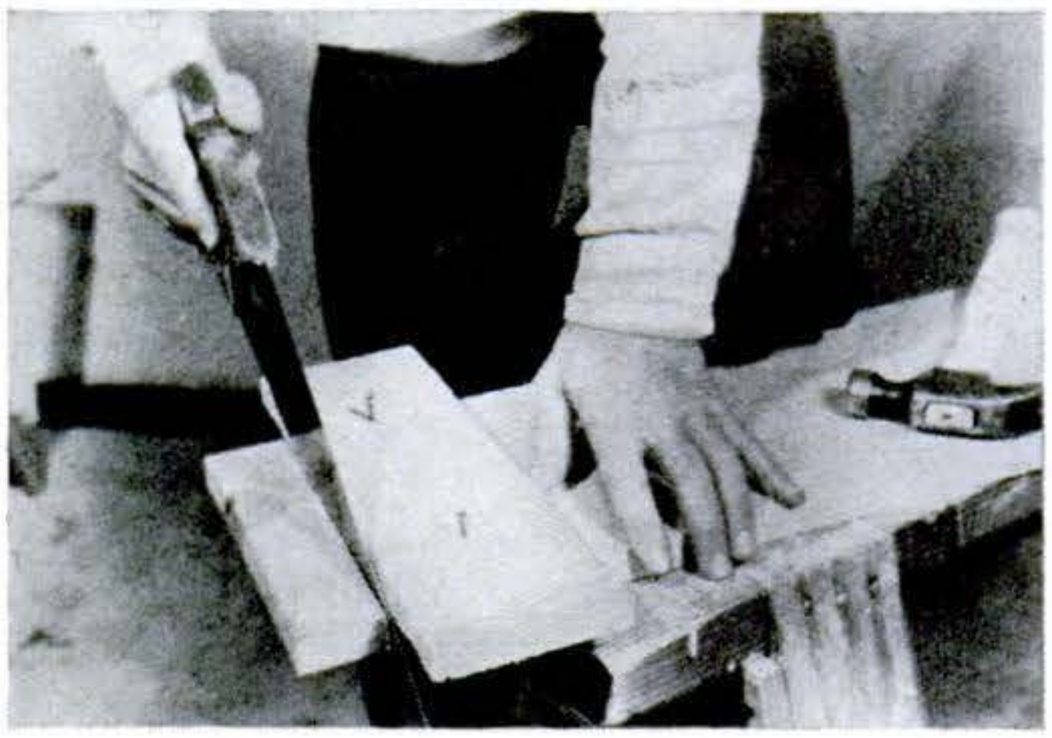
Since the main ingredient of Wonderlux finish is water, which must be absorbed by the wood, the refinishing of old wood requires that all old finish be removed, preferably by scraping. But scraping removes and destroys any patina which may have formed on the surface, leaving practically a new surface.

If the item to be refinished is old enough for its age to give it value, the old finish should be removed with a good grade of paint and varnish remover. If a wood part of an antique is to be replaced, the replacement part can be aged with the potash solution.

Surprising things can happen with Wonderlux, and anyone intending to use it should experiment in a small way to get acquainted with the possibilities.

Even after nearly 45 years of continuous use of Wonderlux, it is impossible for me to impart on paper a real knowledge of the finish. I find that my ability to write about it is far below my ability to use it. But I hope that all readers will get the pleasure from Wonderlux that I have had.

Cleat Guides Square Cut



WHEN cutting a board to a squared line is a critical problem, I nail a cleat with the outer edge directly on the line. Sawing snugly along this temporary guide, I get an accurate cut, and then pull out the nails. Where nail marks are objectionable, clamps will hold the cleat. —*Michael Liggett, Gary, Ind.*

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SAY Merry Christmas

with train boards, tree platforms, Santa Claus,
his sleigh and reindeer, Christmas Greetings displays

Make them yourself—with foolproof patterns

40" HIGH

These Christmas figures and displays are big and bright and colorful. Yet you make them yourself—easily, quickly and with professional results.

On your roof, porch or lawn—or in your living room—they show the world your Christmas spirit.

Your lumber dealer will sell you the Easi-Bild* Patterns you want. Each pattern includes the full list of materials and paint you will need. You buy these from your lumber dealer, too.

Each pattern is full-size. You simply trace it onto a sheet of 5/8" Homasote—then cut it out with a key-hole saw. Your pattern includes complete instructions for the painting. It's as easy as that and the results are truly professional.

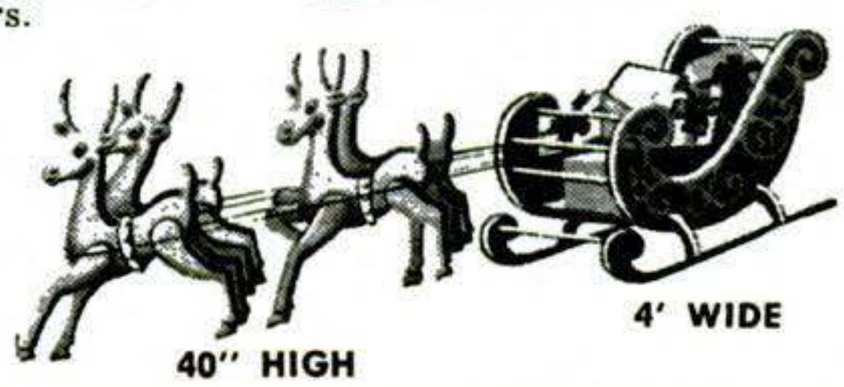
Put a sleigh in front of the Christmas tree, to hold the gifts. Use the 5' x 8' panel for a sound-deadening *train board;* for a *tree platform*—your dealer will cut Homasote to the size you require.

From a single Santa Claus to a complete Nativity Scene (often a group project for school, church or club), you have a project that is worthwhile and satisfactory.

Homasote is the oldest and strongest insulating-building board on the market, saws and nails easier than wood, takes any paint or stain, lasts for years.

Visit your local Homasote dealer today. Or—use the coupon below to order any of the patterns, or to secure the name of your nearest Homasote dealer.

*T. M. Reg. Easi-Bild Pattern Company



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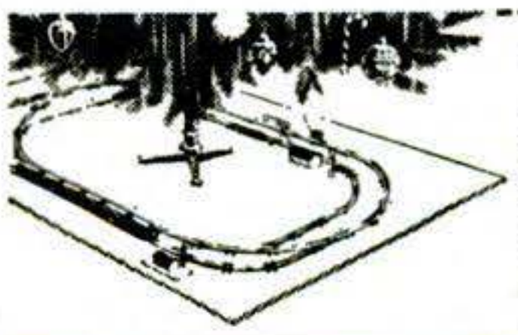

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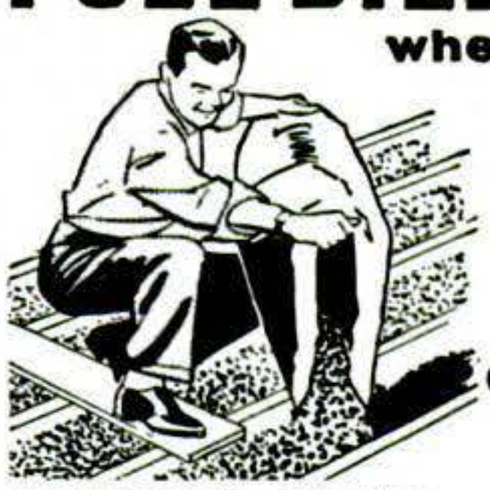

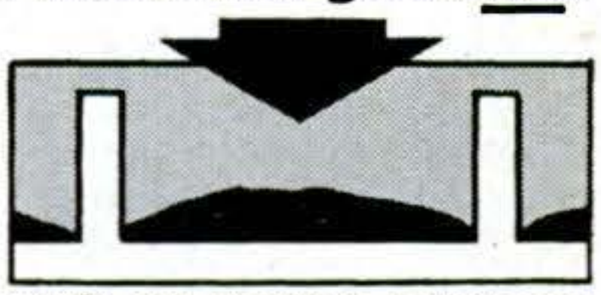

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AT LUMBER OR BUILDING SUPPLY DEALERS

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Hole to Probe Inside the Earth

[Continued from page 89]

Formerly the crust on which we dwell was thought to be the only solid part of the earth—a thin film of slag floating precariously upon a worldwide sea of molten lava. Today that rather alarming notion has been discredited. Refined modern techniques of sounding the earth's depths, by observations of earthquake waves, give a different picture.

In the latest view, the crust rests upon an 1,800-mile-deep foundation of solid rock, the mantle. Then come the earth's molten outer core—probably of iron and nickel, though possibly of some novel pressure-created mineral—and a solid inner core of the same material, unable to melt at the extreme pressure near the earth's center.

Discovery of the solid mantle, relatively a newcomer to our picture of the earth's interior, has called for defining just where the crust ends and the mantle begins. Earth scientists have adopted the Moho as the dividing line. It's a logical one because a sharp change in the nature of the rock occurs at the Moho, as is indicated by an abrupt increase in the speed of earthquake waves just below it.

What lies in the mantle? Temperatures in deep mines and wells, rising about one degree for every 100 feet of descent, hint of a veritable inferno not far below. The earth's rock glows with red heat at a level perhaps no deeper than 30 miles, and becomes white-hot farther down. Fortunately this heat wells up so slowly, through the insulating crust, that it isn't even noticeable to us at the surface—amounting to only 1/25,000 of the heat beating down from the overhead sun.

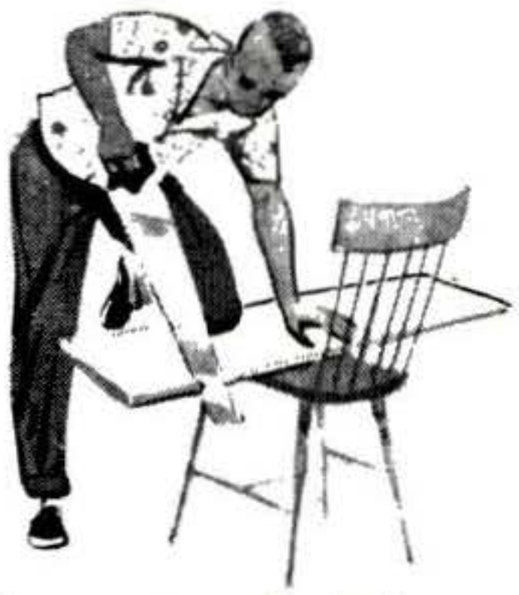
Fantastic pressure in the mantle, comparable at 650-mile depth to the impact of a screaming shell on armor plate, not only may create unknown minerals. It may make the mantle literally diamond-studded. The pressure becomes enough to form the gems at a depth between 80 and 120 miles, one scientist calculates.

From the solid mantle must come the fiery lava that volcanoes spew forth. What melts the lava? Probably rock down there is almost hot enough to melt, despite the raising of its melting point by pressure. So just a slight relief in the pressure, as blocks shift in the earth's

CONTINUED

helpful hints

for the handy husband



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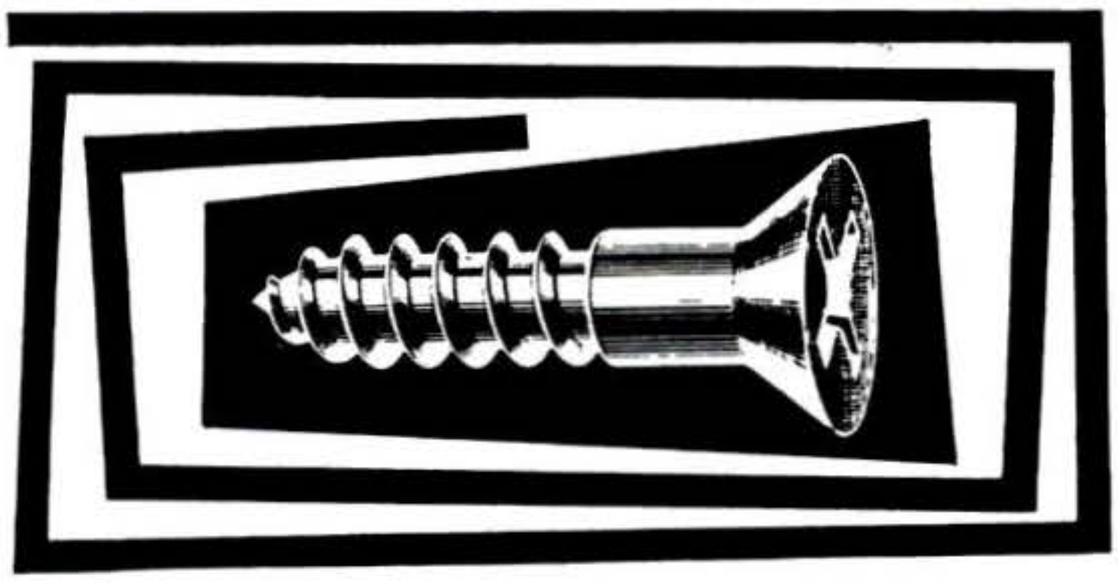

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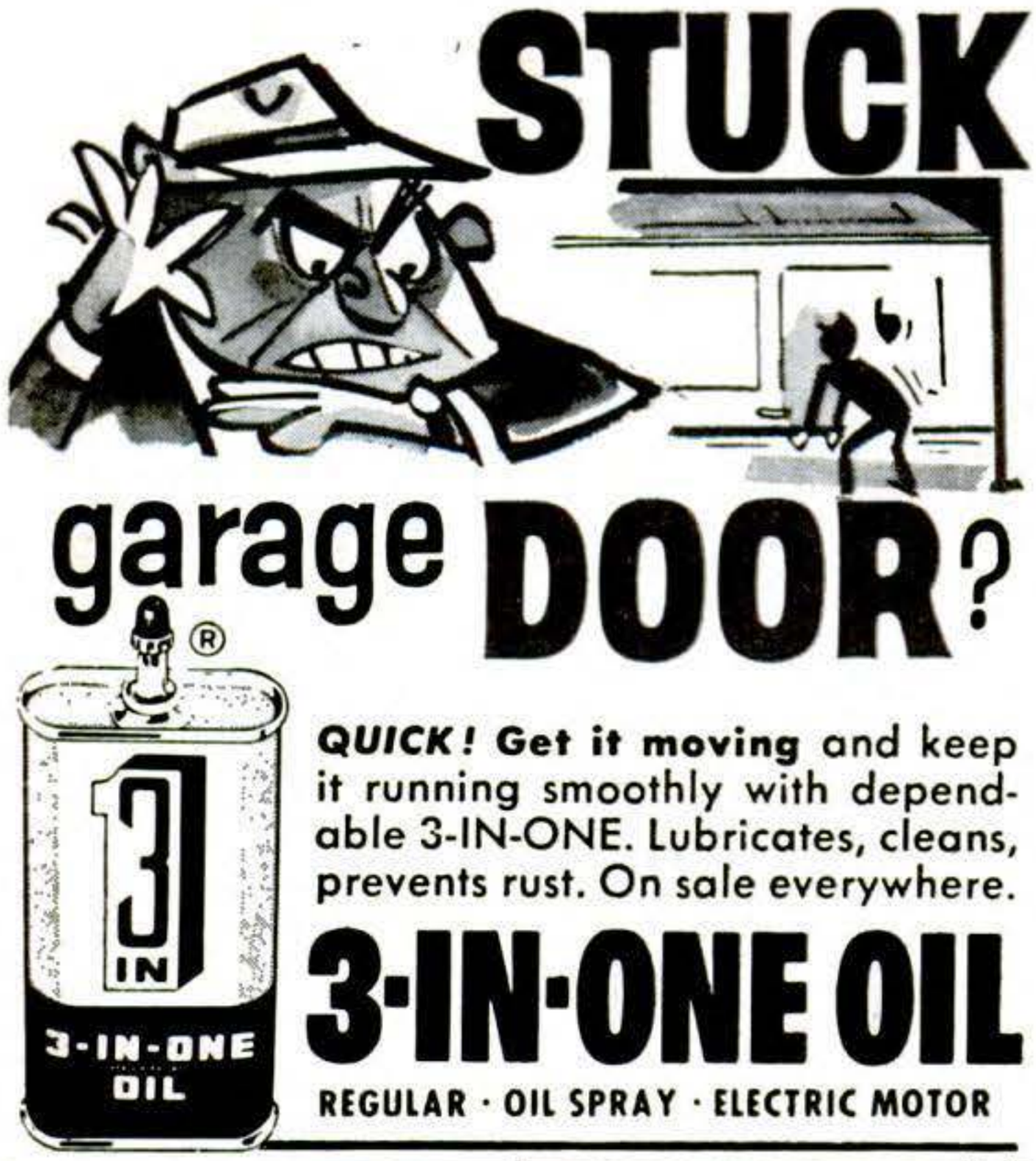

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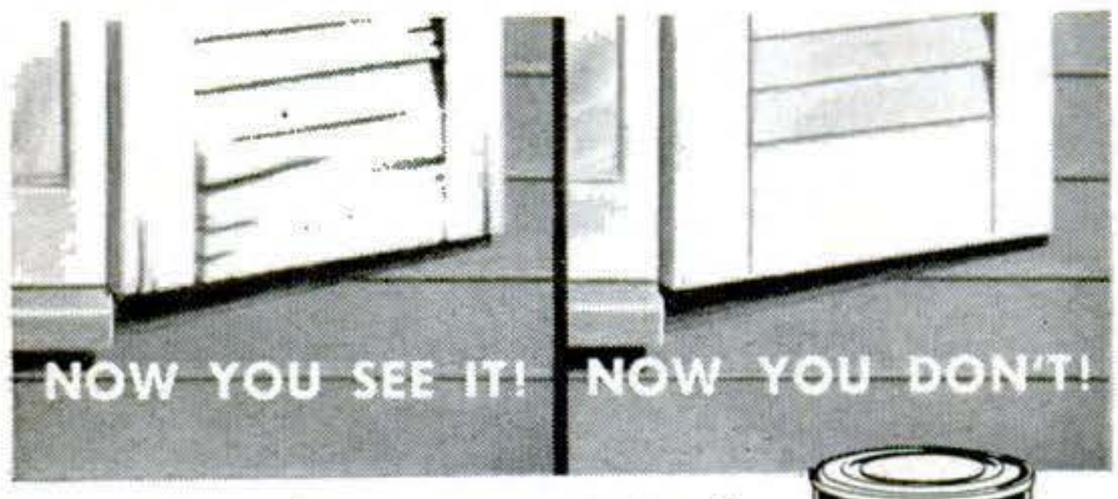

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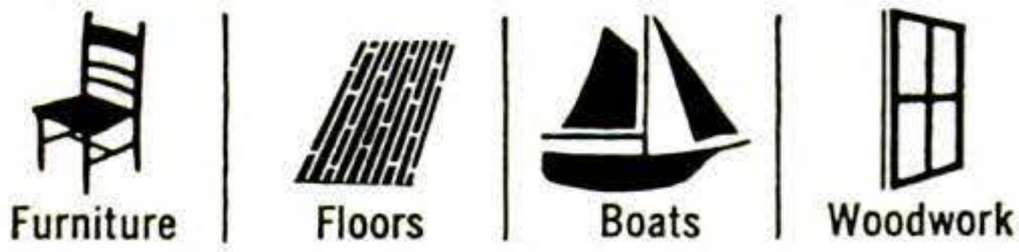

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creaking crust, could allow the rock to liquefy and form a lava pool. Or the energy of earthquakes—only partly dissipated in seismic waves—may locally generate enough heat to boost the rock's temperature to the melting point. Which of these rival theories is right, if either, has still to be learned.

The deepest earthquake known took place 446 miles below the surface. That's the deepest, scientists conclude, at which the mantle's rock is brittle enough to fracture and cause a quake. Below that, they think, heat and pressure make the rock plastic, and capable of flowing. If you could bore a hole that far down and then withdrew the drill, the hole would slowly close up again.

On that puttylike underpinning, is it possible that the earth's whole surface, the entire crust and the upper part of the mantle, could skid about crazily? There's strong evidence that the awesome event has actually happened, repeatedly, in the earth's history.

Shifting poles. Seemingly the North and South Poles weren't always where they are now. Coal beds, leaf fossils, and petrified trees in Antarctica show that it once was tropical. Magnetic studies of ancient rocks appear to provide a detailed record of no less than five major shifts in the poles' locations during the last 600 million years. Illustrations accompanying this article show the poles' supposed travels, and how the skidding of the earth's superstructure could have caused them—as, by this theory, it may some day do again.

These are some of the things we know, or think we know, from indirect ways of investigating the earth's insides. The Mohole will permit checking these surface-based observations against direct ones. Then seismic and other indirect methods can be applied more confidently, and accurately, to plumb depths still beyond reach of drilling.

This country's Mohole project may not be the only one afoot. Russian scientists, it's reported, say they have the needed equipment and that they, too, are looking for a favorable site. So a dramatic international race to the mantle may be shaping up. If so, declare the U. S. planners, they'll welcome it—the more Moholes, the better.

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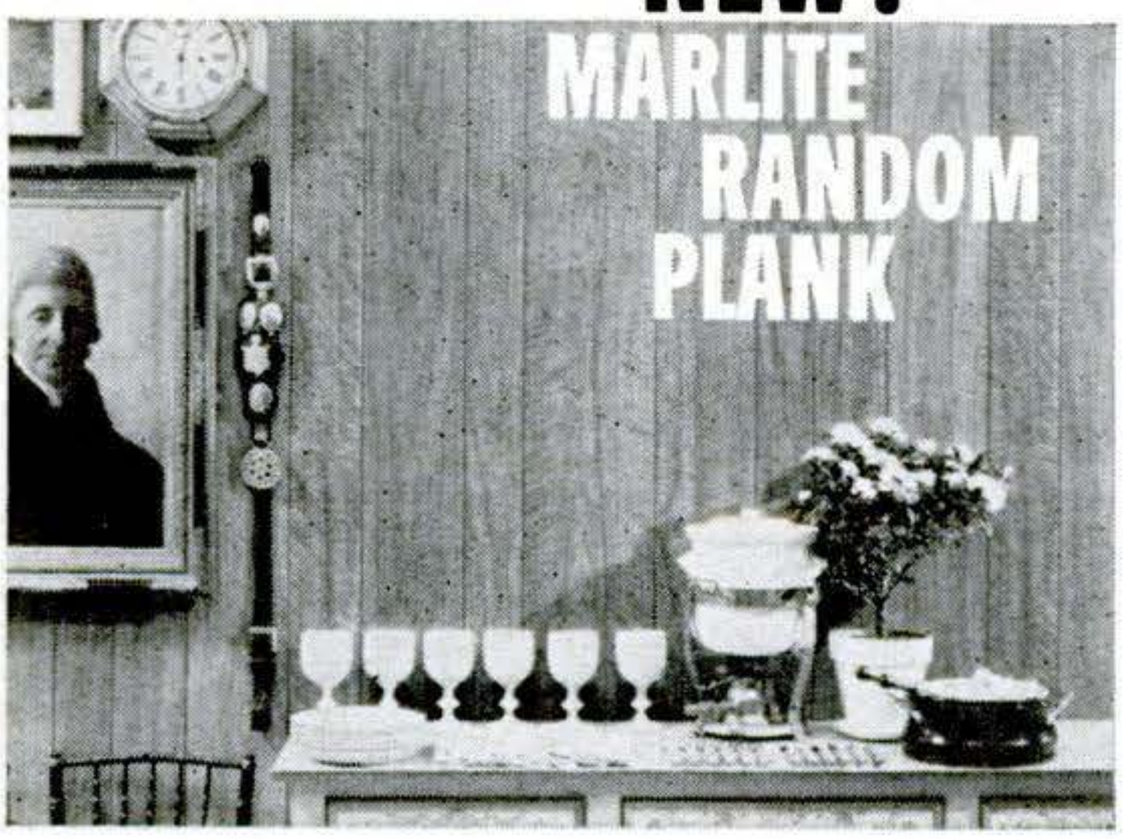

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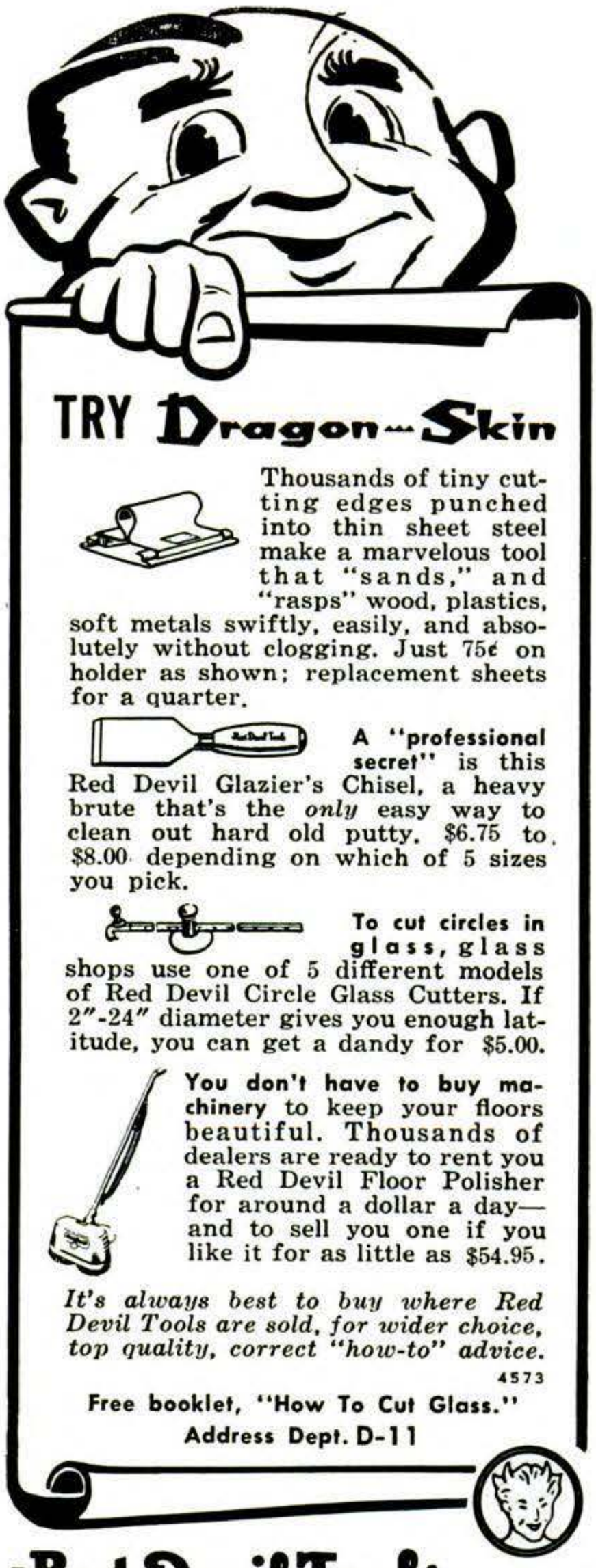

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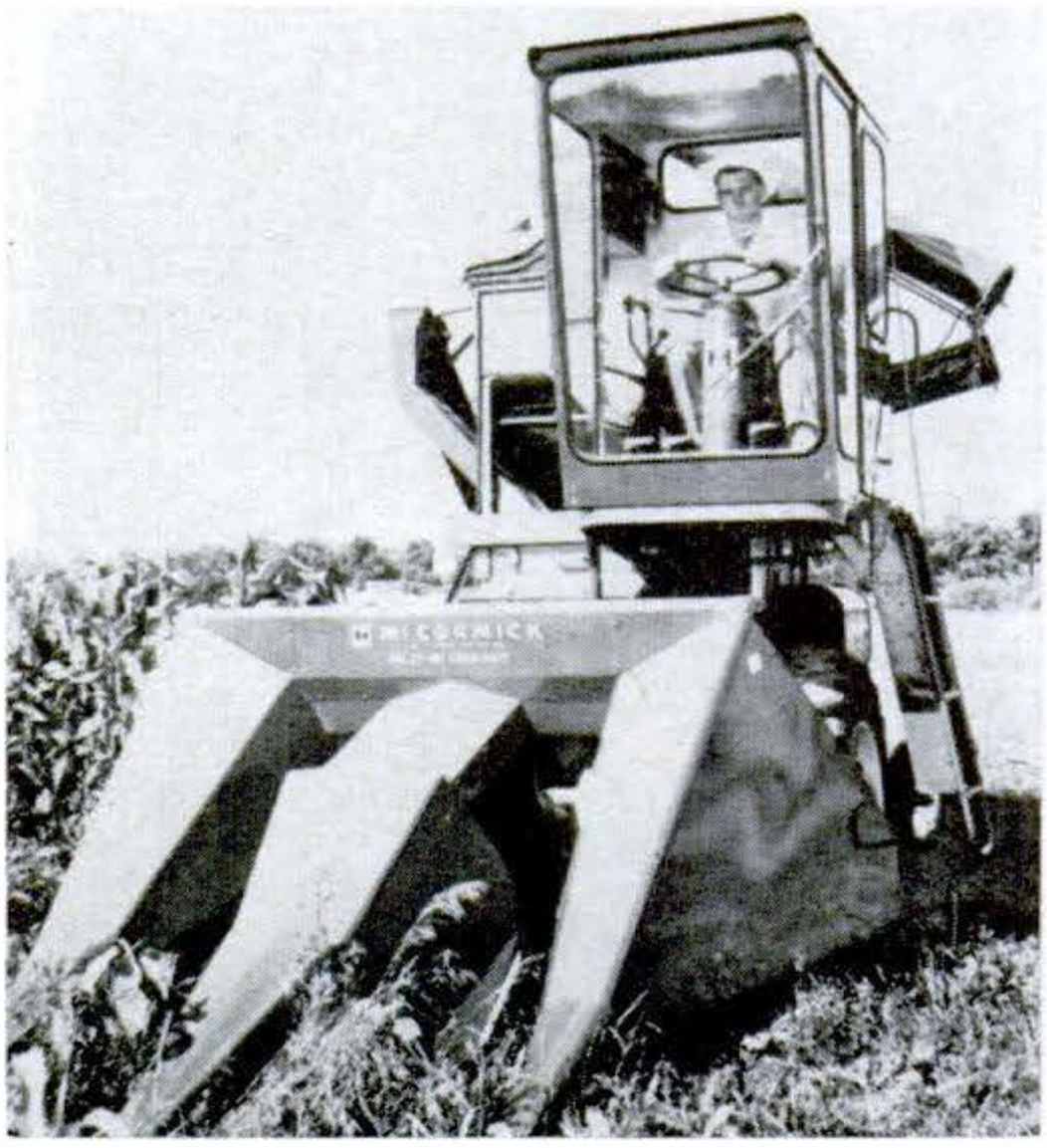

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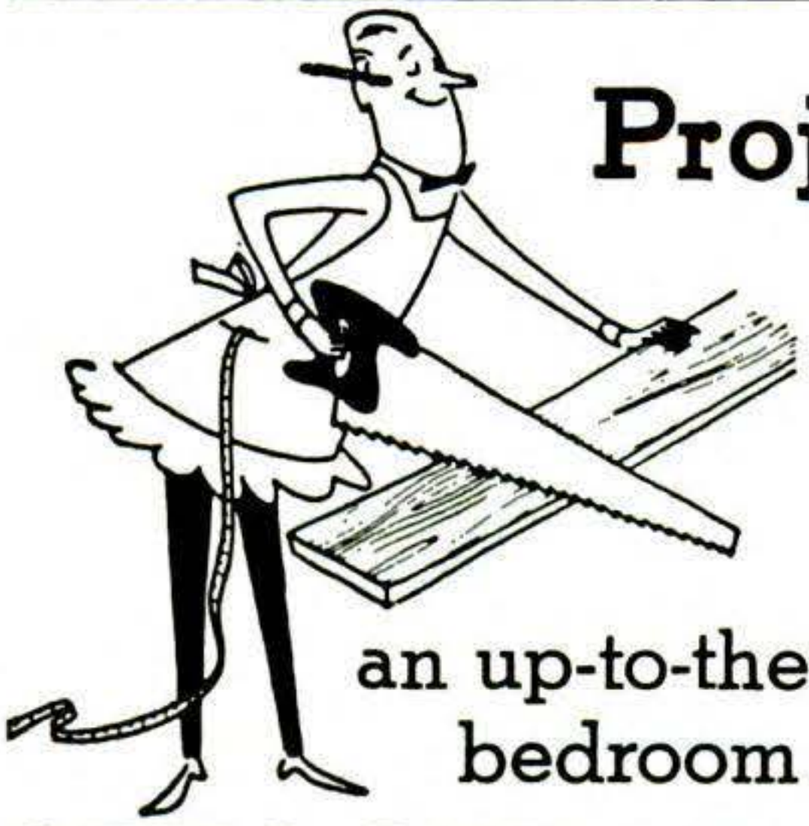

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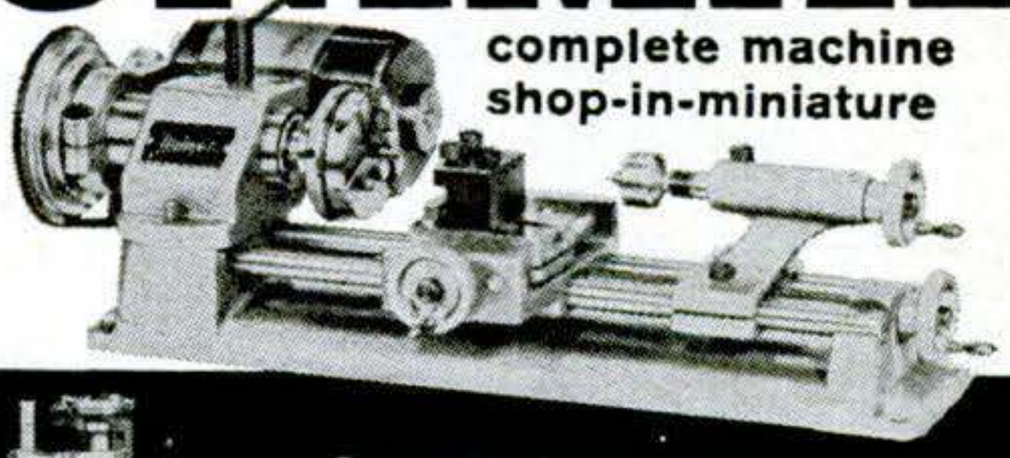

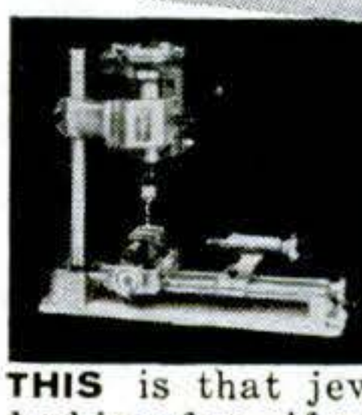

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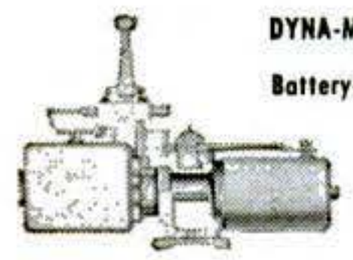

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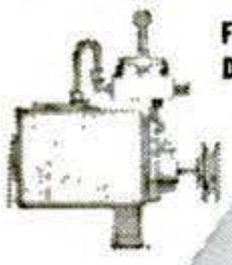

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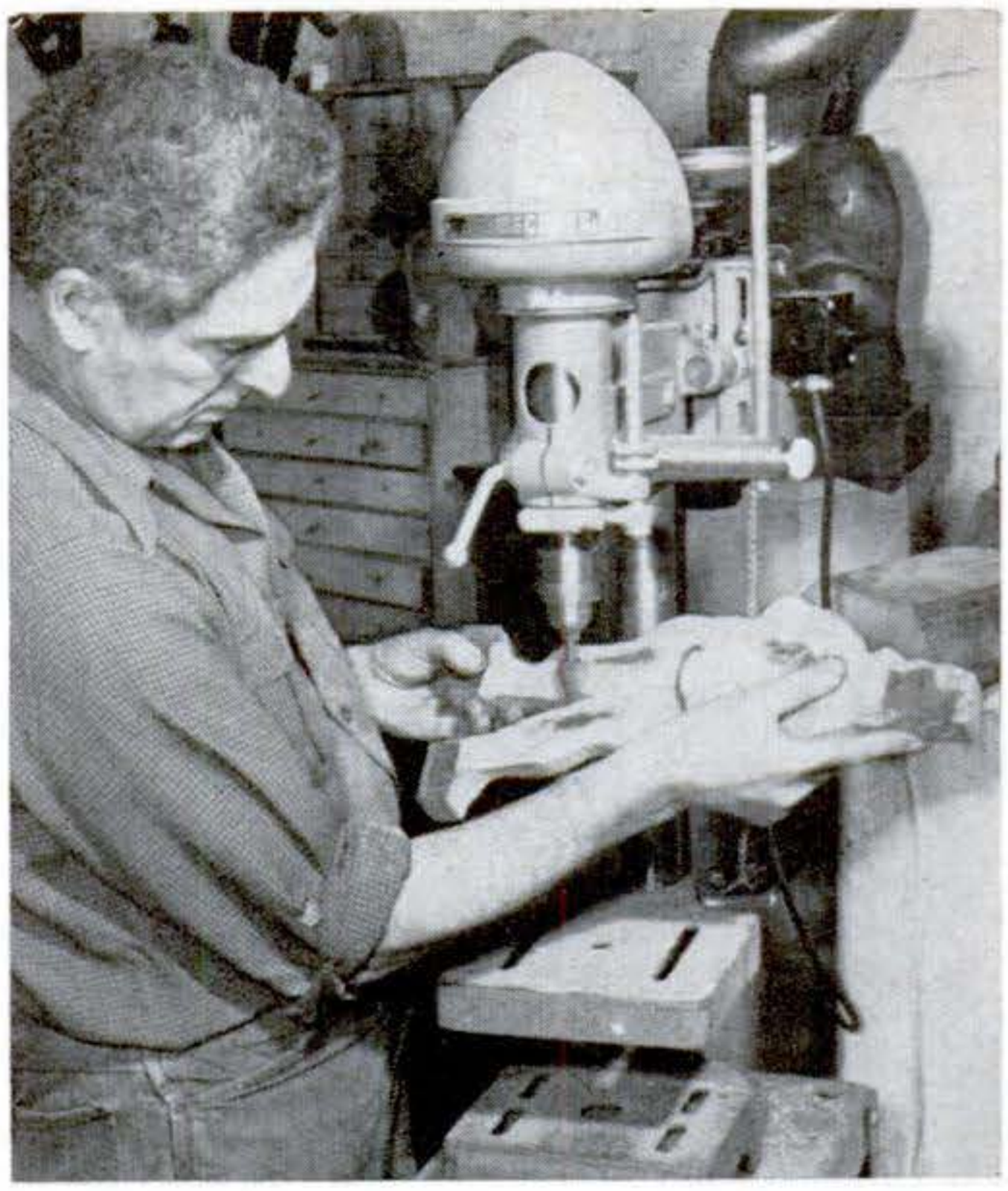

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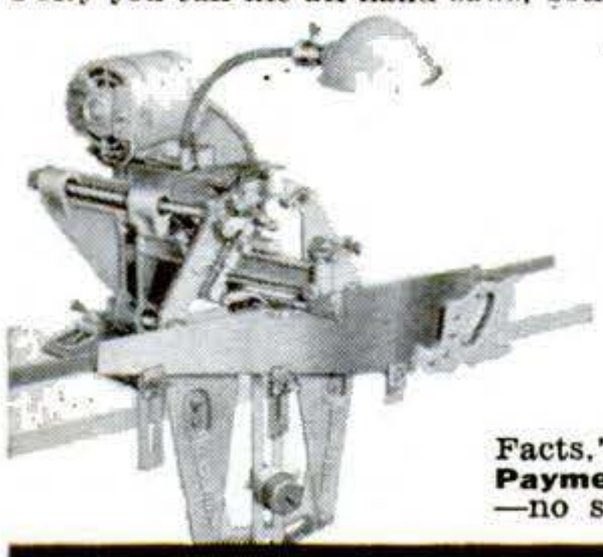

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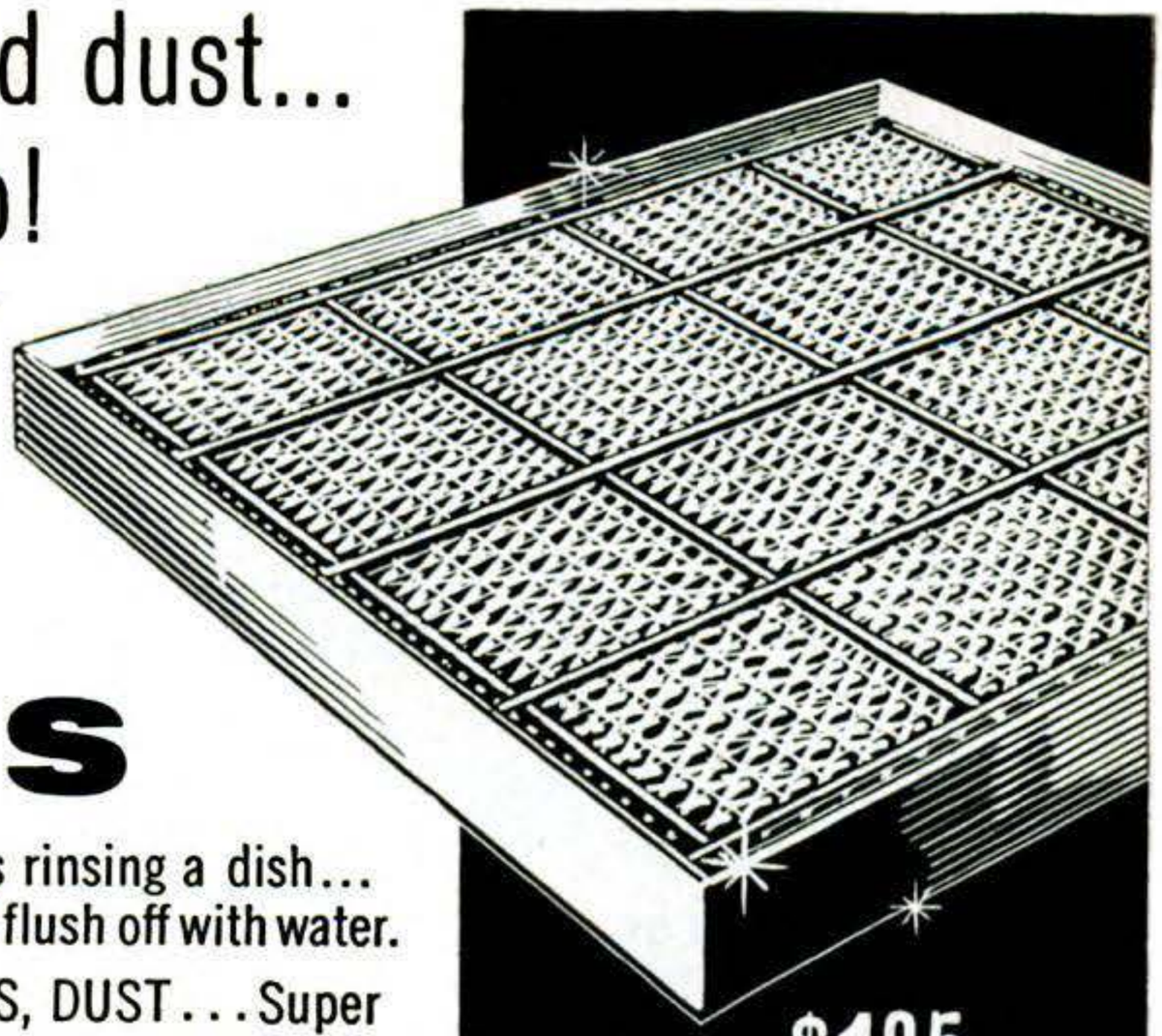

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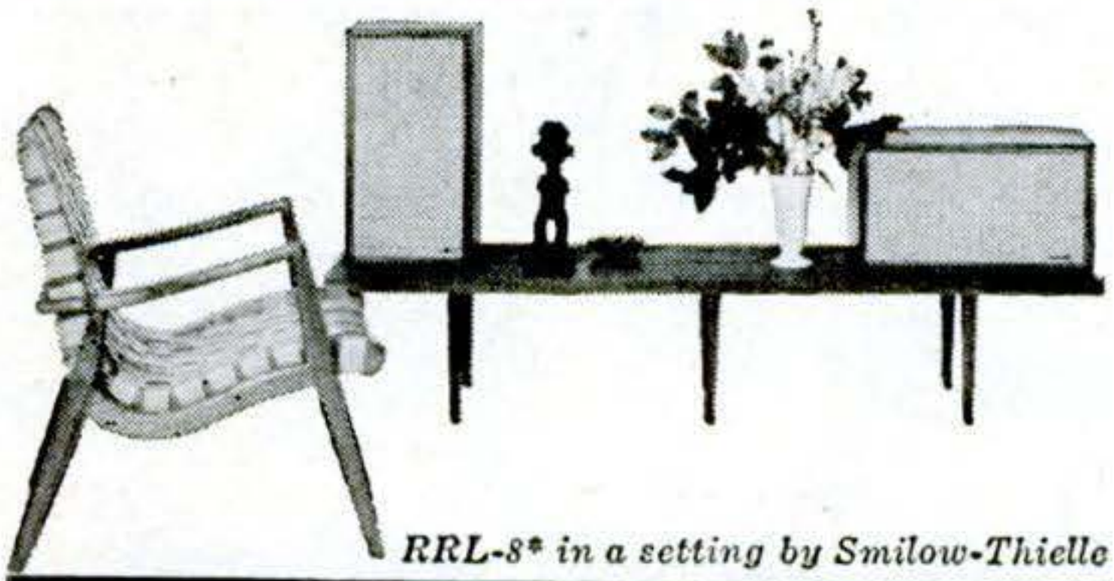

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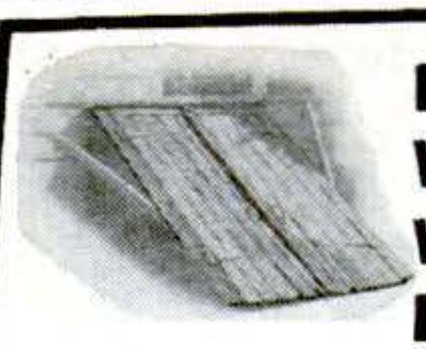

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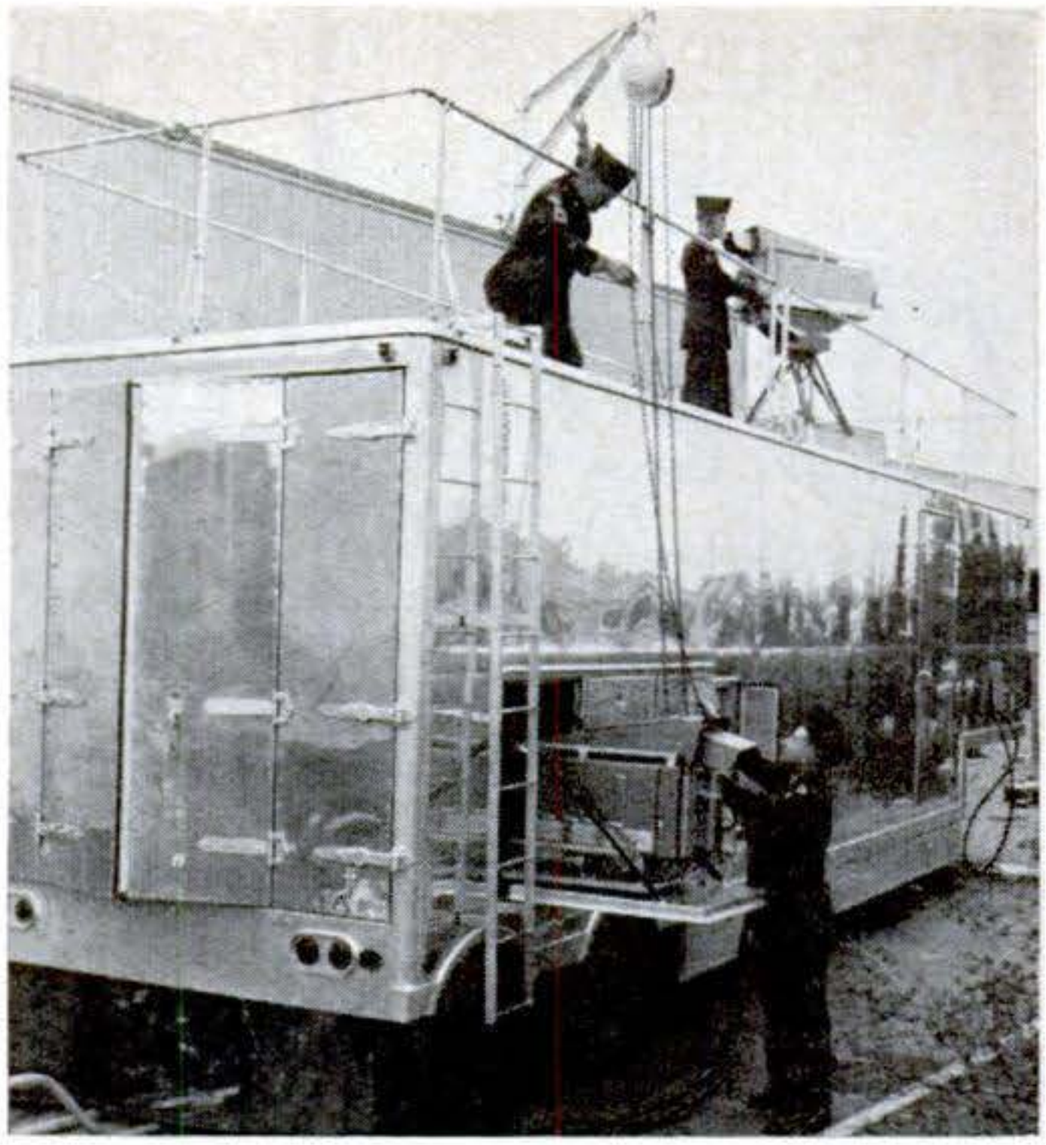

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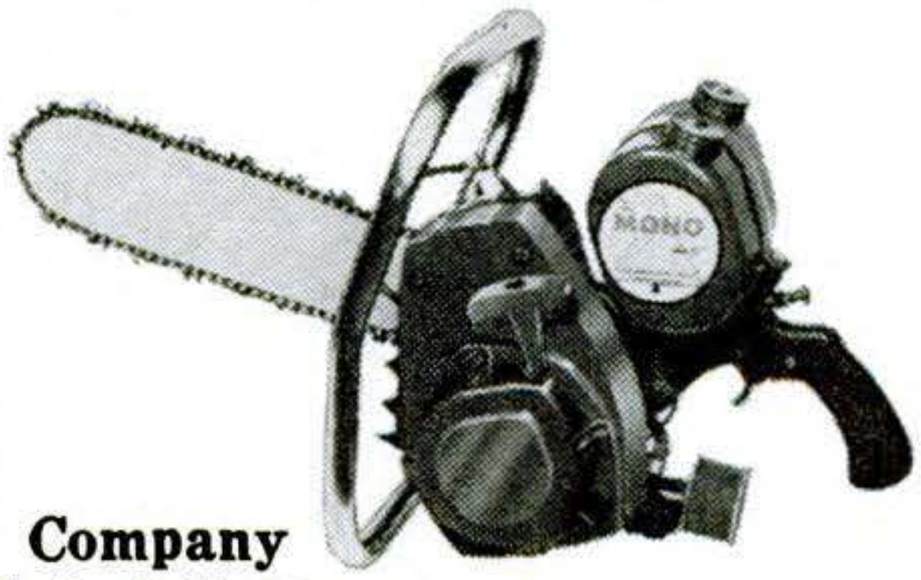

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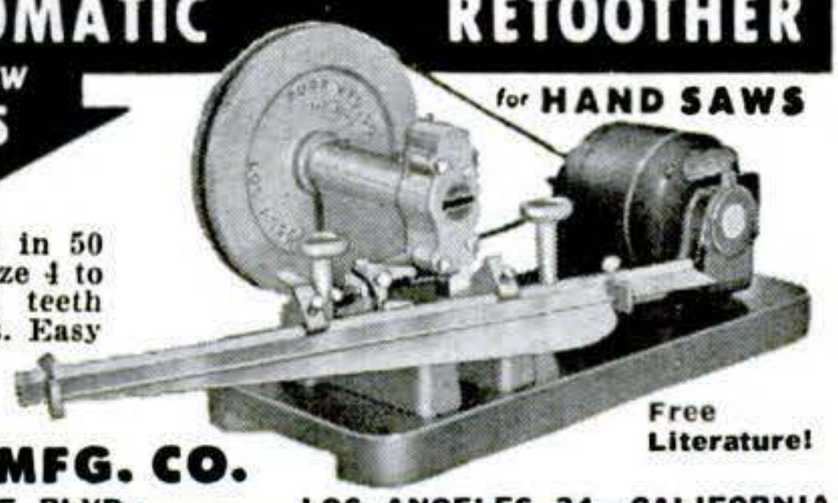

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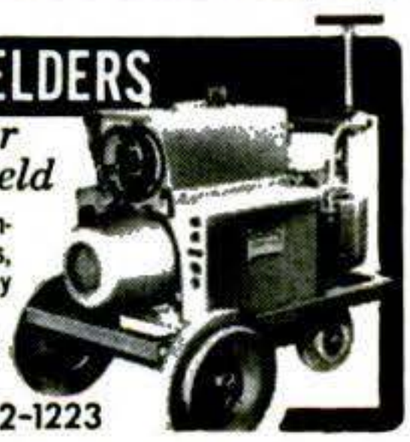

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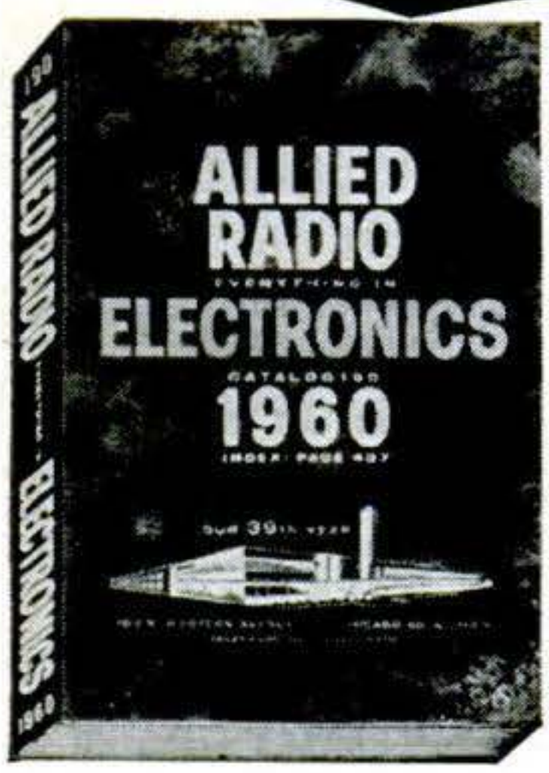

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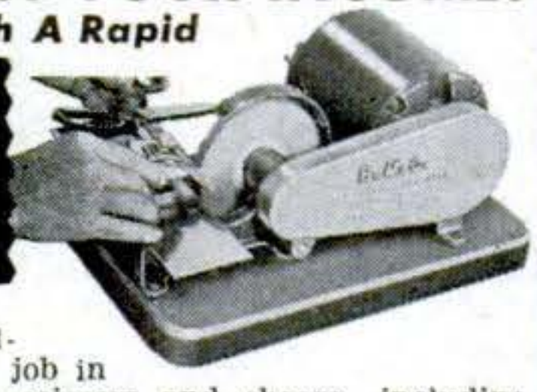

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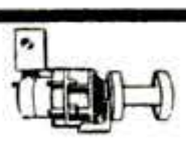

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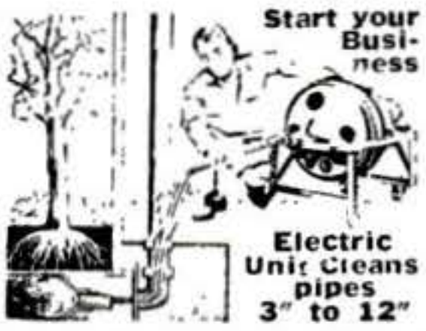

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Electric Unit Cleans pipes 3" to 12"

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Yet anyone can operate this **new Rodding Tool** which is whirled down the drain in a few seconds. **SINKS, BATHTUBS, TOILETS, URINALS, FLOOR DRAINS, HOUSE TO STREET SEWERS** can be cleared of Rags, Grease, Paper, Sand while Cutter blades can be added for removing roots. A new discovery in Swedish Music Wire gives the rod 100% more Flexibility.

Another new unit is the Miller Electric Rodder which has patented cutters that expand automatically to the size of the pipe. It will clean out heavy obstructions in pipe diameters 3" to 12". Smaller Sizes available. But now, what are these Tools worth in **COSTLY PLUMBING BILLS SAVED.** Tear this Ad out—and write your name and address beside it for **FREE BOOKLET** on Hand and Electric Units. Obey that urge. No Agent will call. A postcard will do (Chicago Phone Kildare 5-1702)

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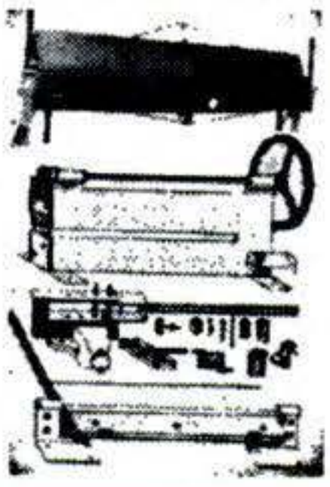

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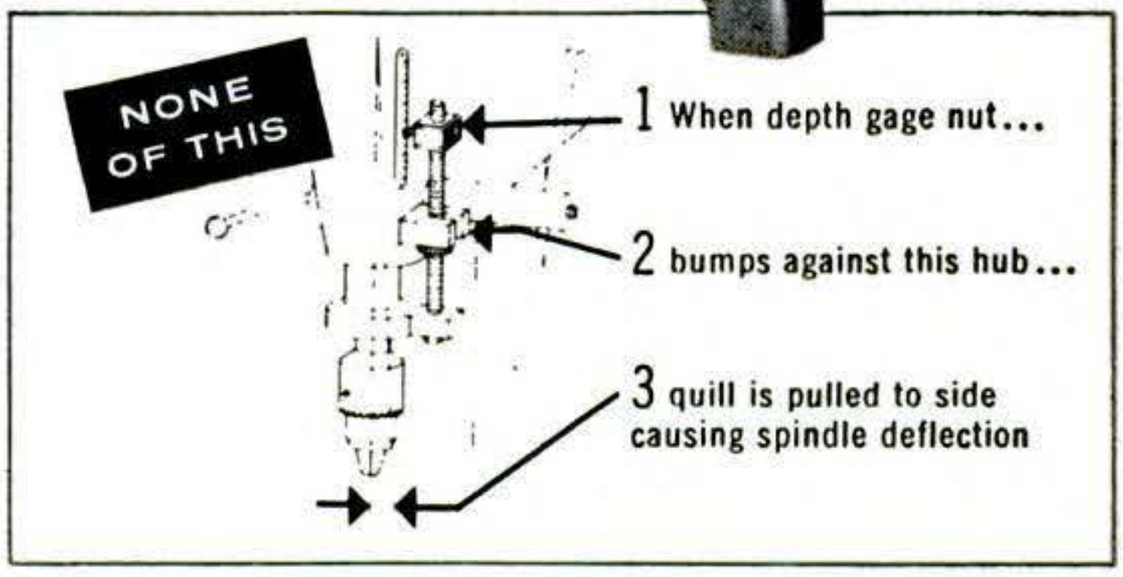

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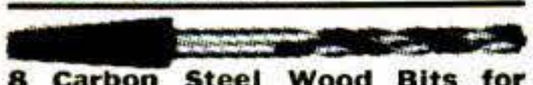

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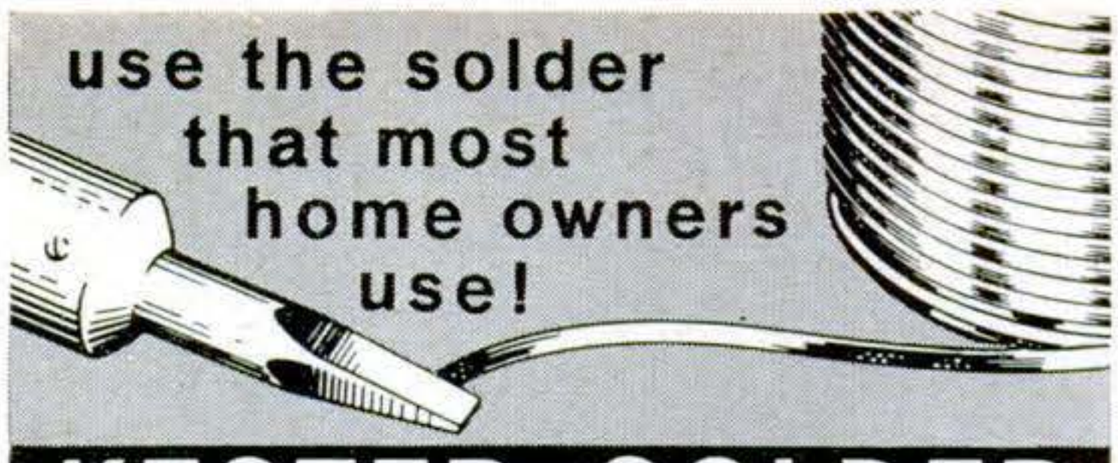

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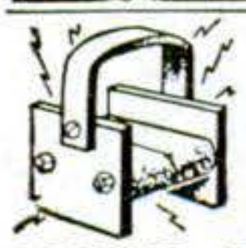

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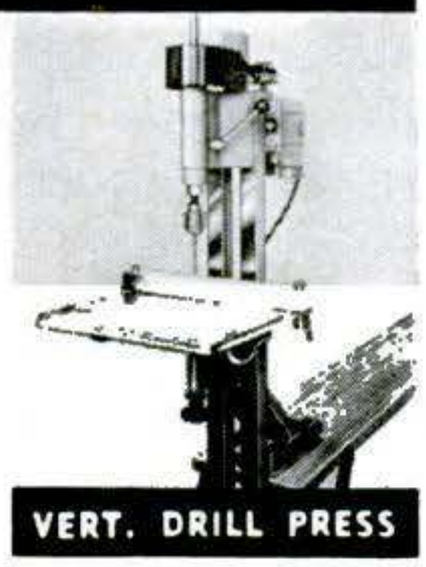

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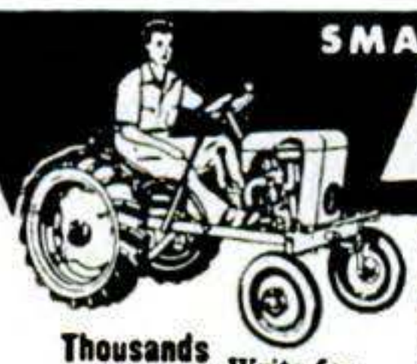

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Non-warping bamboo with scales on a white nitrate face. Face scales are A, B, C1, C, D and K. Other side has S, L & T scales. In Case. **2.95**

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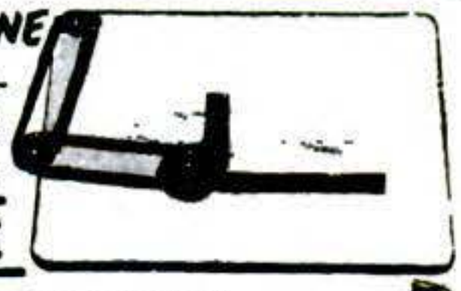

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[Continued from page 143]

panting. Tunnel diodes don't care about temperature, working at 450 degrees below zero, 600 degrees above zero, and everywhere in between. They perk along merrily amidst the deadly bombardment of rays from atomic furnaces. They make excellent high-speed switches (for computer elements), 100 times faster than the transistors now used.

But it's the combination of low noise, high frequencies and low power at low cost that will shake up radio and TV.

More TV stations? Television, for example, is busting its buttons. There isn't room for all the TV channels people want. Today no area can have more than seven regular stations, and only the five largest cities are allotted that many. Putting more on the air would louse everything up with interference. This is an annoyance in New York, where many people want an "educational" channel. It's a real pain in the neck in places like Riverton, Wyo., which has one channel. People who live there take what that channel offers or go play checkers.

The way to make room for more stations is to move television up to higher frequencies that aren't so crowded. This was tried—UHF television—and flopped. The higher frequencies poop out after traveling a few miles. The areas these stations cover—and the audiences they collect—are so small that few have been able to compete with regular TV stations.

A low-noise amplifier would tip the scales the other way. By providing good reception on weak high frequencies far from the station, it would give such stations big audiences. Then they could make money. You'd see many more channels blanketing the country the way radio stations do now.

In one experiment (performed by an amateur on his own), the vacuum tubes were ripped out of a TV set and replaced with very-low-noise amplifiers of the parametric type. It delivered an excellent picture from a UHF station 100 miles distant. Tunnel diodes should work just about as well, better in some ways.

You can't buy them yet. General Electric is first to sell tunnel diodes (the ZJ56, engineering samples only), but RCA and Bell Laboratories are close behind. None of them invented it. They got the idea from an inconspicuous short article in the January, 1958, issue of the *Physical Review*. Its author was bright-eyed 34-year-old Dr. Leo Esaki, a physicist for Sony Corporation in Japan (Sony makes the excellent $30 pocket radios widely sold here). The Japanese know a million dollars when they see it and have filed for a basic patent.

Esaki reported that a tiny sandwich of semiconductor materials—similar to a common rectifier—showed negative resistance. Increasing voltage caused current to *decrease*—the reverse of what happens ordinarily. There is the million dollars. With negative resistance you can build an amplifier (or oscillator or high-speed switch). The small change in voltage causes a big change in current. That is what an amplifier has to do: control a hefty current with a weak signal voltage.

Why it works so well. The tunnel diode exploits a strange electrical process called (surprise!) "tunneling." Electricity "tunnels" through a barrier which, without quantum physics, it could not pass. It's as if a current had jumped past insulation to get from one wire to another, even though the voltage were too low to make the insulation break down.

Tunnel currents, like ordinary currents in a wire, change with the speed of light. They are streams of electrons—an electron entering at one end pushing a different electron out the other end. Vacuum tubes and transistors are different. In them, a single electron has to travel all the way by itself. Single electrons move slowly (30,000,000 m.p.h., slow compared to the 670,000,000-m.p.h. speed of light).

High speed enables the tunnel diode to handle high frequencies, which are currents that change very rapidly. It also keeps noise low. The electrons in the stream are not kicked around individually to get in the way of the signal.

The tunnel diode is the newest magic to come out of the quantum physicists' awesome formulas. In the past decade these wizards of the blackboard have transmuted unlikely rocks to amplify electricity, generate electricity from heat or sunlight, and convert electricity into heat or cold or light.

Don't miss next month's miracle. It'll have to be good to top this one.

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sale! **$24.95 40-piece set** **$19.88**

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Cuts National Coarse (USS) threads ¼-20, 5/16-18, ⅜-16, 7/16-14, ½-13; National Fine (SAE) ¼-28, 5/16-24, ⅜-24, 7/16-20, ½-20; machine screw, 4-36, 6-32, 8-32, 10-24, 10-32, 12-24; and ⅛ in. standard pipe threads. 16 adjustable 1" dies; 1 solid pipe die, adjustable guide die stock, tap-and-reamer wrench, "T" tap wrench, screw pitch gauge and screwdriver. Case has two removable trays.

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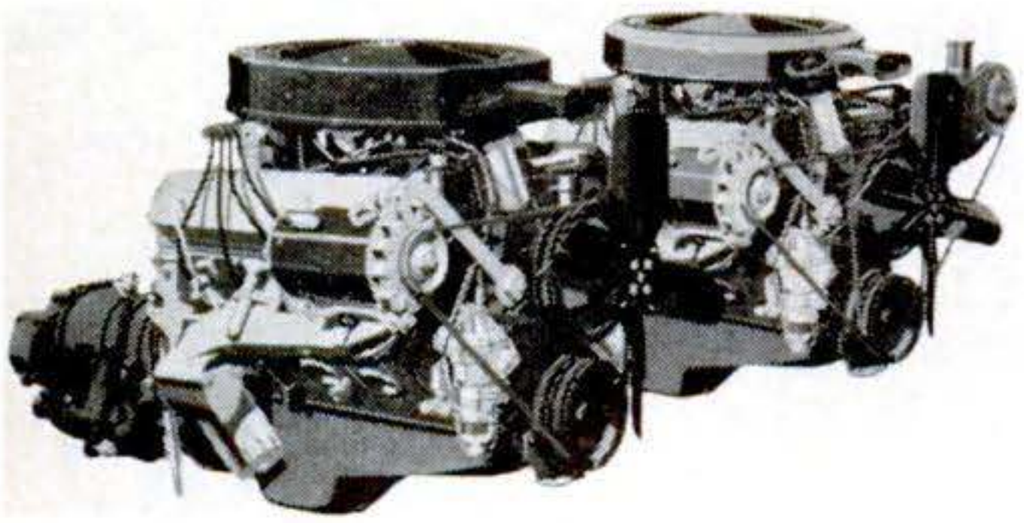
NEW QUADRI-BALANCED RIDE . . . the quietest ride you've ever tried!

For 1960, Oldsmobile brings you a new kind of ride—comfort-balanced four ways.

1. **Wide-Stance Chassis** provides a wider, lower base—gives a road-hugging, steady, stable ride.
2. **Guard-Beam Frame** gives the protection of a steel framework around the passenger compartments; permits the body to be mounted directly on the frame; eliminates "outrigger" type attachments.
3. **Nylon sleeves** inside Olds shock absorbers wear less—together with new "constant-viscosity" shock absorber fluid, produce a smoother, better controlled absorption of all bumps and bounces.
4. **Vibra-Tuned** body mountings insulate body from road noise and harshness—make the '60 Olds the quietest Olds ever!

See your local Oldsmobile Quality Dealer!



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Olds engineers solved the power vs. economy question with two new Rocket Engines for '60.

New REGULAR ROCKET Engine gives traditional Dynamic 88 "Go" on regular, lower-cost gas—standard on every Dynamic 88 model for '60. Owners save about a dollar bill every fill!

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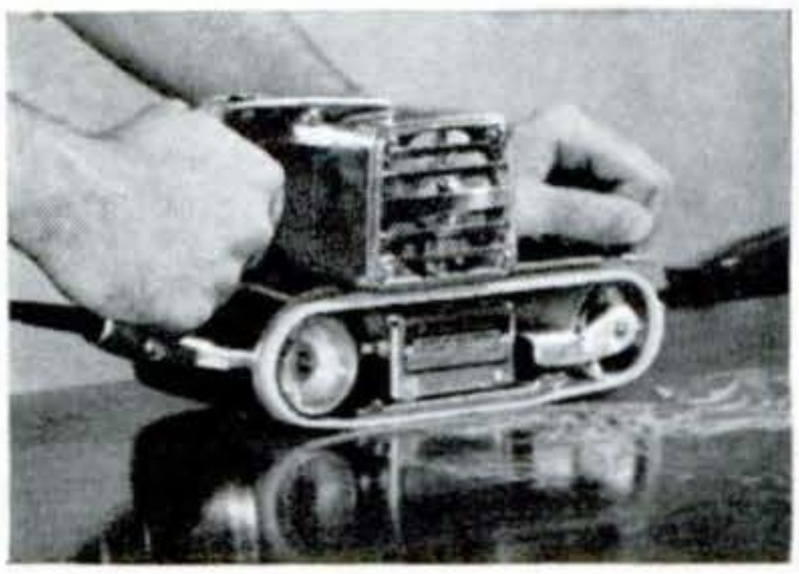
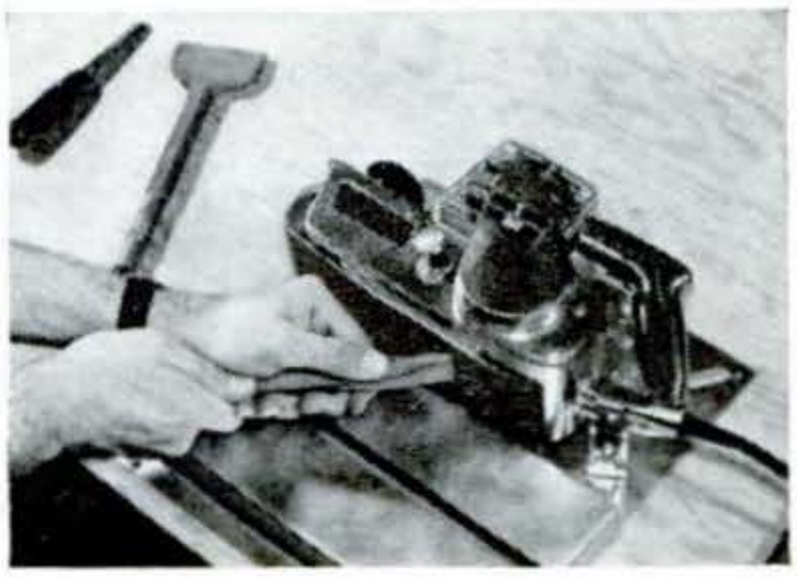
The most versatile sander you can own. The Porter-Cable Belt Sander not only gives you "Professional finishes"—fast . . . it is a real time-saver for heavy stock removal, fine cabinet work, home remodeling, paint and varnish removal, boat work, rubbing, polishing, sharpening, grinding, etc. A really professional quality tool for the homecraftsman and hobbyist.

Ideal for sanding broad surfaces. With correct abrasive, sander quickly fits doors, storm windows, screens.



Quickly removes paint or varnish. With felt and canvas belts, it does a professional job of polishing and rubbing.



With Bench Stand, sands curved edges, small or difficult pieces. Also sharpens knives, chisels, cutting tools.

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Porter-Cable Model 165 Belt Sander with 7′ 3-conductor cord, No. 1/0-A Grit Abrasive Belt, Canvas Belt for rubbing, Felt Belt for polishing, four special compounds for rubbing and polishing, Bench Stand with mitre gauge, "The Finishing Touch"—big illustrated sanding booklet.

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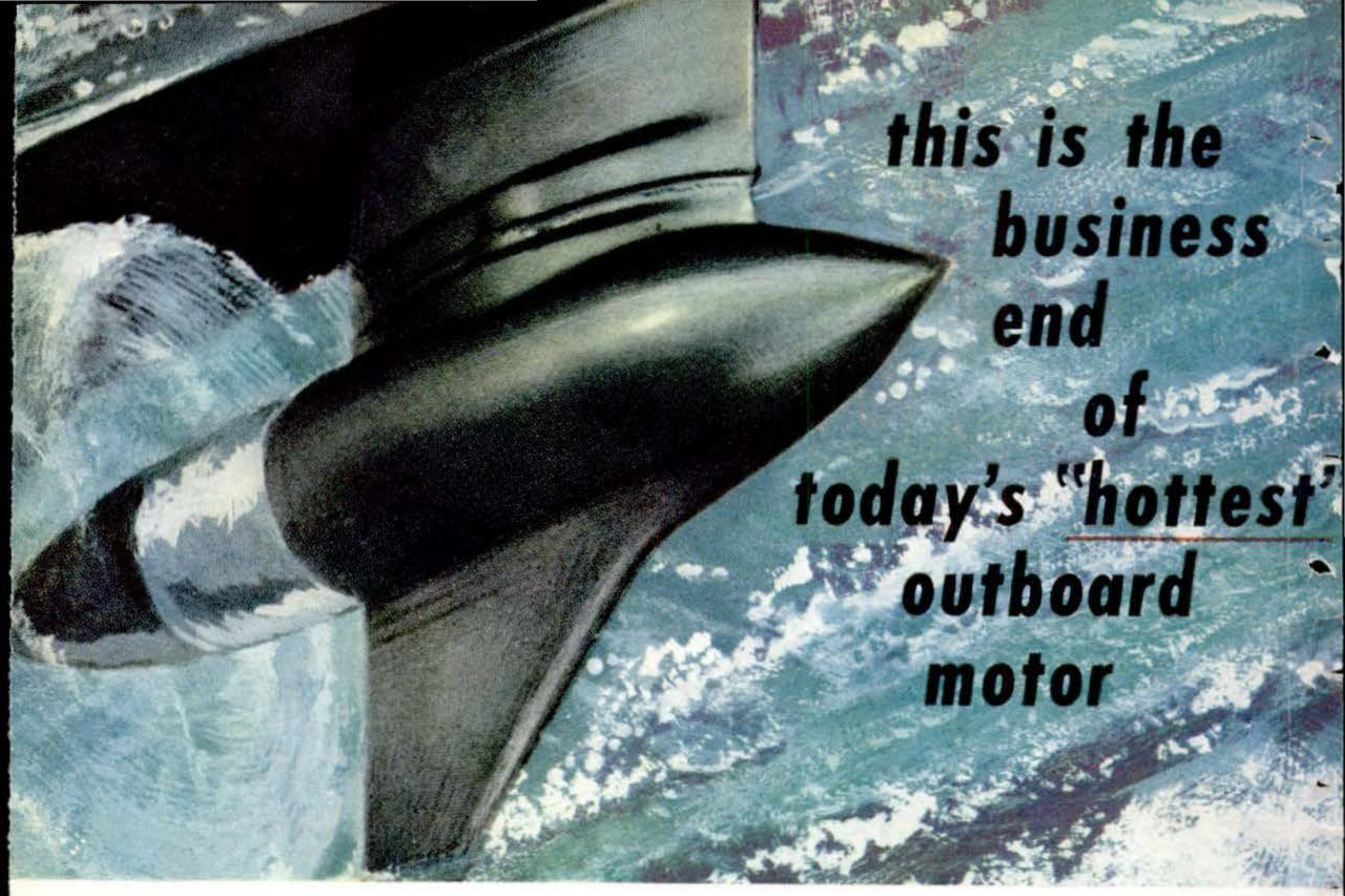

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